MARIYA IVANOVA

THE BLACK SEA

and the Early Civilizations of Europe, the Near East and Asia

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THE BLACK SEA AND THE EARLY CIVILIZATIONS OF EUROPE, THE NEAR EAST AND ASIA

The Black Sea lies at the junction of three major cultural areas: Europe, central Asia and the Near East. It plays a crucial role in enduring discussions about the impact of complex Near Eastern societies on European societies, and the repercussions of early urbanisation across Eurasia. This book presents the first comprehensive overview of the Black Sea region in the prehistoric period. It penetrates artificial boundaries imposed by traditions, politics and language to encompass both the European and Asiatic coasts and both Eastern European and Western scholarly literature. With a critical compilation and synthesis of archaeological data, this study situates the prehistoric Black Sea in a global historical context. By adopting the perspective of technology and innovation, it transcends a purely descriptive account of material culture and emphasises society, human interaction and engagement with the material world.

Mariya Ivanova is a lecturer in Prehistoric Archaeology at the University of Heidelberg and research Fellow at the German Archaeological Institute. She has participated in field projects in Turkey and in southeast and central Europe. She is the author of *Fortified Settlements in the Balkans, in the Aegean and Western Anatolia, c. 5000–2000 BC* and has published articles in *Prähistorische Zeitschrift*, *Oxford Journal of Archaeology* and *Eurasia Antiqua*.

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32 Avenue of the Americas, New York, NY 10013-2473, USA

Cambridge University Press is part of the University of Cambridge.

It furthers the University's mission by disseminating knowledge in the pursuit of education, learning, and research at the highest international levels of excellence.

www.cambridge.org
Information on this title: www.cambridge.org/9781107032194

First published 2013

Printed in the United States of America

A catalog record for this publication is available from the British Library.

Library of Congress Cataloging in Publication data
Ivanova, Mariya.
The Black Sea and the early civilizations of Europe, the Near East and Asia / Mariya Ivanova.
pages cm
Includes bibliographical references and index.
ISBN 978-1-107-03219-4 (hardback)
1. Black Sea Region – Civilization. 2. Black Sea Region – History.
3. Antiquities – Black Sea Region. I. Title.
DJK66.I83 2013
939'.5–dc23 2013019700

ISBN 978-1-107-03219-4 Hardback

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"Artists – as also artisans – are itinerant wayfarers. They make their way through the taskscape, as do walkers through the landscape, bringing forth their work as they press on with their own lives. It is in this very forward movement that the creativity of the work is to be found," wrote Tim Ingold in his essay "The Textility of Making". In my own experience, this view also applies perfectly well to scholarly work. The writing of this book was a journey both figuratively and literally. At the Institute of Prehistoric and Near Eastern Archaeology in Heidelberg I had the unique privilege to follow unrestrained all paths opened by my curiosity. I am indebted to the German Research Council (DFG) for a research fellowship that allowed me to commit to research without the restrictions of administrative and teaching duties and to Professor Joseph Maran for his continuous support and encouragement at all stages of research and writing. In its initial stage, the present study was stimulated by a six-month-long untroubled and inspiring journey in Eastern Europe and in the Middle East enabled by a *Reisestipendium* of the German Archaeological Institute (DAI). The book would never have been completed had it not been for the one-year scholarship with which the DAI supported the writing of the manuscript.

J. Rassamakin generously assisted me during my stays in Kiev. To Juri and his colleagues at the Institute of Archaeology in Kiev I express my deepest gratitude. I am also indebted to many friends and colleagues for supplying me with references and copies, sharing their ideas, offering hospitality and opening for me the doors of excavation storerooms and libraries: Peter Miglus and Adele Bill in Heidelberg; Friedrich Lüth and Knut Rassmann in Frankfurt; Sabine

Reinhold and Svend Hansen in Berlin; Getzel Cohen, Susan Allen and John Wallrodt in Cincinnati; Natalia Shishlina, Olga Brileva, Jekaterina Devlet and Nikolaj A. Makarov in Moscow; Genadij Toshchev in Zaporyzha; Irina Vdovichenko in Simferopol; Arsen Bobokhyan in Erevan; Levan Dschabaschwili in Tbilisi; Vladimir Slavchev in Varna; Krassimir Leshtakov and Vassil Nikolov in Sofia; and Aydogdy Kurbanov in Ashgabat. Alex Bauer (New York) and Ljubov Kircho (St. Petersburg) kindly supplied copies of their work; Bertille Lyonnet (Paris), Igor Manzura (Kishinev), Juri Rassamakin (Kiev), Oscar Muscarella (New York) and Ulf-Dietrich Schoop (Edinburgh) granted permission to reprint material from their work. My appreciation also goes to all who welcomed and assisted me in the foreign departments of DAI, at excavations and in museums in Eastern Europe and the Middle East.

The book is based exclusively on published material, without reference to archives or unpublished artefacts from museum collections. While some secondary literature was also used, my aim was to access all primary publications. I am deeply indebted to the librarians of the Institutes of Prehistoric Archaeology in Tübingen and Heidelberg; the Römisch-Germanische Kommission of DAI in Frankfurt; the Archaeological Institutes in Kiev and Moscow; the Institute for History of Material Culture in Saint Petersburg; the libraries of DAI in Istanbul, Teheran and Amman; the Archaeological Institutes in Erevan and Tbilisi; the Manfred O. Korfmann Library in Çanakkale; the library of the Archaeological Museum in Varna; and the library of the Classics Department and the University Library in Cincinnati. I also acknowledge those who allowed me to see archaeological finds in the storerooms of several research institutions: Natalia Shishlina granted me access to the storerooms of the State Museum of History (GIM) in Moscow, Juri Rassamakin organized the permission for the depot of the Archaeological Institute in Kiev and Olga Brileva generously showed me finds from excavations of the Moscow State Museum for Oriental Art (MINV).

I express my gratitute to my editor at Cambridge University Press, Beatrice Rehl, and to Anastasia Graf, James Dunn and Elise Oranges, who guided me through the process of publication.

My deepest appreciation is due to my husband Gebhard Bieg and my daughter Katharina for their unconditional support and understanding. Without them the completion of this book would never have been possible.

A Note on Transliteration and Spelling of Cyrillic Names

In the present study personal and geographic names have been transliterated from Cyrillic to Roman alphabet in the following way:

а	a	кс	x	х	kh
б	b	л	l	ц	ts
в	v	м	m	ч	ch
г	g	н	n	ш	sh
д	d	о	o	щ	shch
е	e	п	p	ъ	u
ж	zh	р	r	ь	omitted
з	z	с	s	ы	y
и	i	т	t	э	e
й	j	у	u	ю	ju
к	k	ф	f	я	ja

Inconsistencies in transliteration were not wholly avoidable. Exceptions were made for well-established and widespread forms, for example Maikop (and not Majkop) or Azerbaijan (and not Azerbajdzhan). Also, the –я ending in some regional names was transcribed with –a (e.g. in Ossetia and not Ossetija).

Two peculiarities of geographic names in the former Soviet Union have to be always kept in mind. During the early decades of the Soviet period, "politically incorrect" names were replaced by new ones, for example stanitsa Tsarskaja (Tsar's hamlet) was renamed to Novosvobodnaja ("the hamlet of new freedom"). Moreover, after the fall of the Soviet regime, local Ukrainian and Caucasian forms (e.g. Tripylia instead of Tripolie) gradually replaced Russian versions of geographical names. In this study I use the name that appeared in the original publication of the archaeological site.

Table 1. Chronology of the Black Sea littoral, Anatolia and the south Caucasus.

cal. BC	Lower Kuban	North coast	West coast	South coast	North-central Anatolia	Eastern Anatolia	South Caucasus
	Novotitorovskaja	Jamnaja	Jamnaja Cernavoda II	İkiztepe cemetery	Alişar 13M	EBI Arslantepe VIB	Late Kura-Arax
3000	Psekup Chishkho	Mikhajlovka II Zhivotilovka	Cernavoda III Tripolie C2 Usatovo	İkiztepe CC	Alişar 12–19M	LC4 and LC5 Arslantepe VIA	Early Kura-Arax
3500	Sereginskoe Pkhagugape	Mikhajlovka I	Cernavoda I Khadzhider Tripolie B2 and C1	İkiztepe DD/EE		LC2 and LC3 Arslantepe VII	Leilatepe Late Sioni
3750	Svobodnoe						Sioni
4000		Skelja Novodanilovka	Varna Tripolie B1			LC1 Arslantepe VIII	Alikemek Tepesi Kjul Tepe I Tekhut
4500		Mariupol	Tripolie A	İkiztepe BB	Büyük Güllücek	Middle Chalcolithic	
5000	“Neolithic”	“Neolithic”	“Neolithic”	İkiztepe AA	Yarıkkaya	Early Chalcolithic	Shulaveri-Shomutepe

Table 2. Chronology of Mesopotamia, Iran and Central Asia.

<table>
<tr><th>cal. BC</th><th>Mesopotamia</th><th>Northwest Iran</th><th>West-central Iran/Qazvin</th><th>Southwest Iran</th><th>Kerman</th><th>Seistan & Baluchistan</th><th>Kopet Dag & Northeast Iran</th></tr>
<tr><td rowspan="8">3000
3250
3500
3750
4000
4500
5000</td><td>Proto-Dynastic
Ninevite V</td><td>Godin V</td><td>Kura-Arax</td><td>Susa III</td><td>Yahya IV</td><td>Shahr-i Sokhta II</td><td>Namazga IV
Hissar IIIA</td></tr>
<tr><td>Jemdet Nasr
Eanna III-II</td><td>Godin VI.1</td><td>Ghabristan IV
Sialk IV</td><td>Susa III Malyan</td><td rowspan="2">Iblis IV
Yahya VB-A</td><td>Shahr-i Sokhta I
Mundigak III</td><td rowspan="2">Namazga III
Geoksyur
Hissar IIB</td></tr>
<tr><td>Late Uruk
Eanna IV</td><td rowspan="2">Godin VI.2

Godin VI.2</td><td>Ghabristan IV</td><td rowspan="2">Susa II (22–17)
Giyan VD</td><td>Mundigak II
Mehrgarh V</td></tr>
<tr><td>Middle Uruk
Eanna IX-V
Gawra VIII</td><td>Ghabristan III
Sialk III.6–7</td><td rowspan="2">Iblis II-III
Yahya VC</td><td rowspan="2">Mundigak I
Mehrgarh IV</td><td rowspan="2">Namazga II
Yalangach
Hissar IC-IIA</td></tr>
<tr><td>Early Uruk
Eanna XII-X
Gawra X-IX</td><td>Godin VI.3
Geoy M</td><td>Ghabristan II
Sialk III.4–5</td><td>Susa I (27–23)
Giyan VC</td></tr>
<tr><td rowspan="2">Ubaid
Eanna XVIII-XIV
Gawra XIII-XI</td><td>Godin VIII-VII</td><td>Ghabristan I
Sialk III.1–3</td><td rowspan="2">Early-Middle
Bakun
Middle Susiana
Giyan VA-B</td><td>Iblis II
Yahya VI</td><td rowspan="2">Mehrgarh III</td><td>Namazga I
Hissar IA-B</td></tr>
<tr><td>Godin X-IX
Dalma
Pisdeli</td><td>Sialk II.1–3
Sialk I.2–5</td><td>Iblis I
Yahya VII</td><td>Anau IA</td></tr>
<tr><td>Halaf</td><td>Godin XI
Hajji Firuz
Hasanlu X</td><td>Sialk I.1
Zagheh
Chesmeh Ali</td><td>Archaic and Early Susiana</td><td>Yahya VII</td><td>Mehrgarh II</td><td>Djeitun</td></tr>
</table>

Introduction

> [A]t that time this sea was not navigable, and was called "Axine" (inhospitable) because of its wintry storms and the ferocity of the tribes that lived around it, and particularly the Scythians, in that they sacrificed strangers, ate their flesh, and used their skulls as drinking-cups; but later it was called "Euxine" (the hospitable), when the Ionians founded cities on the seaboard.
>
> Strabo, *Geography* 7.3.6

The clear-cut outlines of the almost completely landlocked Black Sea bring to mind another geographical unit, the Mediterranean. Historians and archaeologists exploring the Black Sea often have been tempted to resort to ideas developed for the Mediterranean region (see Özveren 2001; Doonan 2009). However, the Black Sea is not the miniature of its southern neighbour: it is a region of striking ecological contrasts. The southern and eastern coastlands are a warm and humid country cut off from the outside world by the foggy and heavily forested chains of the Pontic Alps and the Caucasus. The north and northwest littoral of the Black Sea could not be in more contrast: an arid, grass-covered temperate plain which extends for hundreds of kilometres into the interior of the continent. Neither did the Black Sea ever develop into a cohesive region of culture and trade comparable to the Mediterranean world. The region actually enjoyed several short periods of political and economic integration, but the stimulus always came from outsiders who sought to exploit the Black Sea as a supplier of staples and exotic goods. Unity arose either by the initiative of foreign settlers, as in the period of the Greek colonies in Antiquity and of the Italian merchant cities at the end of the Middle Ages, or by the political will of the Mediterranean empire which happened to control the Straits.[1] Today, research in the Black Sea region is informally divided between several disciplines, which are funded by separate grant-making bodies (see King 2004, 4). The southern littoral is treated as a part of the Middle East; the west is studied together with the Balkans, while the northern and eastern coasts belong to the vague field of "research in the former Soviet Union".

If peoples around the Black Sea never had a common history, except for the brief periods of intervention from the larger Mediterranean world, does it make sense to study the Black Sea as a unit in prehistory? External observers have expressed a spectrum of opinions of the Black Sea. It has been described as an isolated and hostile region on the far-off periphery of the known world, its indigenous peoples as backward and ignorant (Braudel 1966, 110; see also King 2004, 44, 65).[2] More significantly, the Black Sea has been conceived as a frontier, the zone along a political boundary, which is characterized by harsh conditions and inhabited by distinct "frontier" communities, serving as a buffer between the civilized world and the barbarians (see King 2004, 8–11; Ascherson 1995, 8, 60–64). There is also the view of the Black Sea as a *plaque tournante* (turntable) for the empires of the Middle East, the Mediterranean and the Eurasian steppes (Bratianu 1944). At the end of the Middle Ages, for example, when the steppes between the Danube and China fell under Mongol rule and the northern branch of the overland trade route to China was reopened, the Black Sea was transformed into a focal point in European trade with Persia, India and the Far East. For a short period Black Sea trade rivalled in global importance the largest trading ports of the Mediterranean (Özveren 2001, 75; King 2004, 87–90). In the late nineteenth century, the region attained an equally important political role as a part of the "Eastern Question". Yet the most fruitful idea of the Black Sea is probably the image of a bridge. Most obviously, the Eurasian steppes represent a geographical corridor connecting inner Asia and Europe. Moreover, in historical times, major overland trade routes from Central and Eastern Asia to Europe ended at the eastern Black Sea ports of modern Azov (Tana), Batumi and Trabzon (Trapezund), while the large rivers emptying into it acted as channels leading deep into the interior of Europe. It is this unique position of the Black Sea at the crossroads of Asia and Europe that makes it more than an arbitrarily circumscribed area and a meaningful unit of analysis.

THE SOVIET SEA

For most of the twentieth century, Black Sea archaeology developed under the shadow of the Soviet empire.[3] The unchallenged explanatory framework for all historical disciplines, including archaeology, was the official ideology of historical materialism (Trigger 1989, 235 f.). The writings of Marx did not provide many clues for the study of pre-class societies. Hence, Marxist study of prehistory was constrained only by the basic principles of Marx's philosophy, especially the recognition of change in the means ("forces") and relations of production as the principal source of change in human society (Trigger 1989, 219 f.). However, since conformity to the official ideology and to the policy of the Communist Party was closely overseen, many scholars were reluctant to engage with theoretical issues, which might have easily become politically dangerous. In the later decades of the Soviet period, the compilation and description of data in the tradition of cultural history dominated in archaeology. In field practice, the primary aim of reconstructing (Marxist) history encouraged an excavation strategy with large horizontal exposures. Together with the conduction of huge long-term salvage projects in the areas of industrial construction, this practice created an enormous body of archaeological data that was never sufficiently analysed and published. These peculiarities of theory and practice in Soviet archaeology strongly discouraged the writing of syntheses.

The fall of the Iron Curtain was followed by a period of economic crisis and ethnic conflicts in the Black Sea. A sharp decrease in state funding brought fieldwork virtually to a halt (see Dolukhanov 1993). Theoretical research also experienced difficult times. The theoretical framework of Marxism became unpopular, although there were no alternative explanatory models to replace it. On one side, the archaeologists were more concerned about mere survival than about theoretical sophistication (see Anthony 1995). The sections for theoretical research were among the first to close due to financial shortages (see Koryakova 2002, 245). On the other side, the abuse of Marxism for the purposes of political indoctrination led in the later decades of the Soviet period to a veritable trend of "methodological nihilism", a deep mistrust for any involvement with theoretical issues (Rassamakin 2002b, 274). Archaeological research focused on data description, and especially on the analysis of unpublished materials from past field expeditions. Thus, while the political and linguistic boundaries between the East and West have become less impermeable in the recent two decades, the methodological and conceptual divide between former Soviet and Western (especially Anglo-American) archaeology has yet to be negotiated.

THE BLACK SEA BETWEEN EUROPE AND THE ORIENT

This book is a comprehensive study of the Black Sea littoral in the prehistoric period, from the arrival of the first farmers in the sixth millennium to the beginning of the Bronze Age in the early third millennium BC. Its main concern, however, is the fourth millennium, the best-studied and indeed the most significant period in the early prehistory of the Black Sea.

The fourth millennium was a time of dynamic change that witnessed one of the key events in the history of the Old World: the emergence of the first urban centres in Southwest Asia. Gordon Childe described urbanization as the transformation of small self-sufficient, kin-based villages into large complex societies supporting bureaucracy, full-time craft specialists and long-distance trade (Childe 1934; see Childe 1950, with a summary). Childe was the first to call attention to the "revolutionary" character of the process of urbanisation and to its wide repercussions across Eurasia. The effects of this major event on continental Europe were further pursued by Andrew Sherratt, who focused mainly on technological innovation in food acquisition and nutrition (see Sherratt 1997a, 2002).[4] The "second generation" of plant and animal products and the new technologies of animal-powered tillage and transportation, which emerged in the urban core and reached Europe in the course of the fourth millennium, Sherratt argues, profoundly changed the economy and the culture of its neolithic inhabitants. The innovations triggered an expansion of the settled area from the river valleys into the interfluve zone and an enlargement of the pastoral sector (Sherratt 1993).

Strategically situated between the Middle East and Europe, the Black Sea might have played an important role for the spread of technological innovations during the fourth millennium BC. The aim of this study is to explore the Black Sea as a case study for the transmission, adoption and impact of technological innovation on European societies in prehistory.

THEORETICAL BACKGROUND AND CONCEPTS

"Traditional" archaeologists study past societies and their technology by describing the variation in archaeological data in time and space and making empirical generalizations. The positivist reorientation in Anglo-American archaeology of the 1960s brought about a dramatic reaction against this standard approach. Patterns in material culture were now considered to reflect behavioural responses to environmental constraints; the "processual" archaeology of the 1970s and 1980s claimed to reconstruct the processes which happened in the past by investigating the linkages between the environment, human behaviour and the material record. Material studies, not only of artefact variability but also of technological variation, were considered obsolete by most adherents of the processual school unless they could be employed in support of theoretical generalizations (see Stark 1998, 3 f.).

A recent revival of studies of past technology in itself owes much intellectual inspiration to the French theoretical tradition, especially to the school of *cultural technology* which emerged in France in the early 1970s as a collaboration between ethnologists, ethno-archaeologists and experimental researchers and was inspired by the theoretical writings of Mauss (1936) and his student Leroi-Gourhan (1943).[5] Its members advocate a "technological" approach to technology, based on the awareness of the physical phenomena that take place during technical action (Lemonnier 1992, 27).[6] They put emphasis on the exact and complete account of technological information and have developed a recording tool which treats technology not as a compilation of isolated lifeless objects but as a sequence of actions and gestures, a *chaine operatoire*.[7] Moreover, French anthropology of technology does not assume a divide between society and technology. Its proponents argue that technology is a system of actions that are guided by human choices and are embedded in a social system of meanings (see Lemonnier 1986; 1992, 86).[8] The notions about technology on which this book is based derive from the French *technologie culturelle* and from the works of Ingold (1999, 2000, 2010).

A principal concern of the book is the holistic approach to technology. Observations of living technological systems show that the practice of "extracting" single technologies and studying them in isolation does not promote adequate understanding of past technological endeavours (cf. Sillar and Tite 2000, 14; Lemonnier 1986, 151).

What archaeological analysis habitually treats as separate technological areas (for example the processing of food, clay, bone, metal and stone) is actually a set of interdependent activities. Interdependence arises simply from the fact that practitioners of different crafts share and borrow from each other strategies of raw material procurement, tools and operations. Yet more significant than these superficial links is the common mental template that underlies and binds all techniques of a particular human group. Leroi-Gourhan (1945, 340, 344–345) demonstrated that this *milieu technique* is coherent with the general mental traditions of a given society and is embedded in a specific natural environment. In a similar line, Pfaffenberger (1988, 245) argued that the analysis of technology "requires at least a working knowledge of a society's biological environment, history, social organization, political system, economic system, international relations, cultural values and spiritual life. Such analyses are by no means easy; they require nothing less than a commitment to situate behaviours and meanings in their total social, historical and cultural context. Yet nothing less will suffice if we seek to illuminate the nature and consequences of our attempts to humanize nature".

ORGANIZATION OF THE BOOK

This study begins with an overview of the natural environment in the Black Sea littoral in the first chapter. Chapter 2 introduces the notions of technology and technological innovation and considers the factors that influenced the spread and adoption of innovations. Chapter 3 offers a brief account of the key technological innovations that accompanied the emergence of farming in Southwest Asia and reviews the evidence for their spread into the littoral of the Black Sea in the sixth and fifth millenniums BC. In Chapters 4 through 7, I focus on the fourth millennium and zoom in to details to situate the technology of the Black Sea inhabitants in their environmental, social and cultural contexts. Finally, Chapter 8 zooms out to the global picture and offers a discussion about the role of the Black Sea in the transmission of technological knowledge and experience between Europe and the Orient.

1

Environment

THE VALLEY OF THE LOWER KUBAN

The delta and the valley of the Lower Kuban are surrounded by extensive lowlands, the Azov-Kuban steppe, and are affected strongly by the seasonal floods of the river during snowmelt in the mountains. Springtide in the lower course of Kuban lasts from March until July and used to transform the plain into a vast wetland intersected by numerous tributaries, old channels, lakes and lagoons. During the Soviet era, however, this ecological system was irreversibly altered by the regulation of the water runoff of Kuban, the construction of a large water reservoir and irrigation system of channels and ditches, and the establishment of extensive rice fields and fish ponds (Fig. 1.1) (Marushevsky 2003).

The environmental conditions in the Azov-Kuban steppe are more favourable in comparison to other regions of the steppe belt. Abundant water, higher and more reliable precipitation, milder winter temperatures and longer periods free of frost and deeper chernozem soils provide for sustainable farming (Ivanov and Matychenkov 1996). Precipitation reaches 600–800 mm in the Caucasus piedmont and along the Lower Kuban, while in the steppe between Kuban and Don the annual precipitation decreases to 400–600 mm, an amount comparable to that in the Ukrainian Black Sea region (Volodicheva 2002, Fig. 15.2). The modern boundary between grassland and forest lies at 500 m altitude, but during the Early and Middle Holocene the steppe zone may have reached an altitude of 700 m (Alexandrovskij 1997; 2000, 245; Alexandrovskiy et al. 2001).

The coastal lowland of Kuban does not contain strategic resources, although numerous sources of copper and silver ores and alluvial deposits of gold are situated in the mountains some 100 km to the south of the Lower Kuban. A source of cinnabar exists at Sakhala, a mine in a remote location between Gelendzhik and Novorossijsk (Alexandrovskaja et al. 2000, 112).

THE GRASSLANDS OF THE NORTH BLACK SEA

The coastal plain between the Lower Don and the Southern Bug is a vast expanse of flat land crossed by deep ravines and intersected by numerous river valleys with longitudinal direction. The seashore is very low and straight, and the rivers flow into the Black Sea and the Sea of Azov through large estuaries surrounded by extensive marshy areas. There are only two regions with higher elevations. To the northeast of the Azov Sea, the plain changes to a rolling country, the Azov upland and the Donets ridge, rising to an altitude of 200–300 m. Along the southern periphery of the Crimean peninsula, the ridges of the mesa-like Crimean Mountains rise to an average height of 700–1200 m and fall abruptly toward the sea.

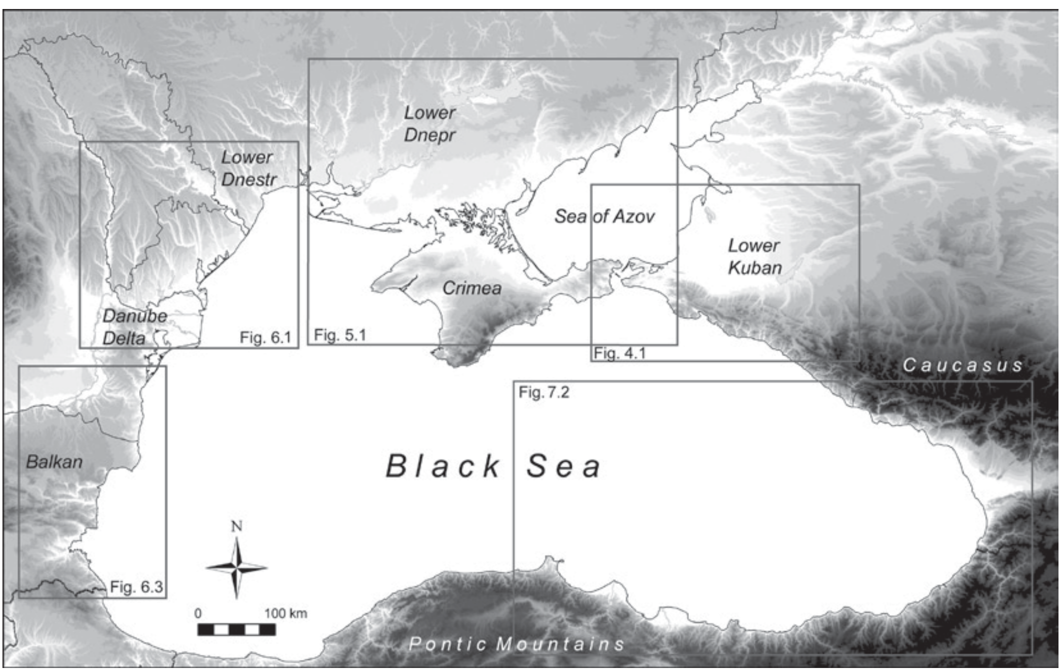

Figure 1.1 Map of the Black Sea.

The lowland north of the Black and Azov Seas belongs to the temperate dry grasslands of Eurasia, a zone characterized by continental climate with cold winters, low precipitation and high rates of evaporation. Northerly winds predominate throughout the year, and the hilly regions bordering the grasslands in the north retain most of the moisture. Annual precipitation in the steppe measures 350–450 mm, with a maximum of rainfall in June, followed by a long, hot and dry summer (Jordan et al. 2001, Table 2). Rainfall fluctuates strongly from year to year and summer winds cause severe droughts. The areas between the lower courses of Dnepr and Molochnaja and the northernmost part of the Crimea (the coastal areas of Lake Sivash) are very dry, and rainfall drops in some years to 300 mm. The low moisture supply, combined with evaporation rates far exceeding precipitation, prevent the spread of forests into the coastal plains. Trees (mainly oaks) and shrubs grow in humid areas such as the slopes of watercourses, ravines and depressions, while the mouths of the large rivers support extensive floodplain forests. The largest part of the region, however, is a treeless dry plain covered with drought-resistant grasses. The most inhospitable, desert-like region of the steppe is situated in the vicinity of the Sivash Lake in the North Crimea, whose salinized soils sustain only poor xerophytic vegetation.[1]

A notable exception of this environmental pattern is the southern periphery of the Crimean peninsula, a narrow strip of land sheltered from the cold winds and entirely different in its climate, vegetation and water supply from the surrounding grasslands. The coast of the Crimea receives annual rainfall of c. 700 mm, while the amount of precipitation at high elevations in the mountains reaches 1400 mm. The region features a sub-Mediterranean environment with cinnamonic (a variant of *terra rossa*) and brown forest soils, evergreen vegetation, densely forested slopes and abundant year-round streams and springs.

The temperate grasslands and river forests of the Black Sea used to support diverse fauna, while the coastal wetlands still represent a major station of migratory birds. Tens of thousands of waterfowl spend the winter in the marshy areas near the river mouths, especially in the large marshes of the eastern Crimea. Migratory fish, entering in spring for spawning and leaving in autumn, are abundant in the river estuaries and especially in the shallow brackish waters of the Sea of Azov. The migratory herds of large ungulates (aurochs, saiga antelope, wild asses and wild horses), however, disappeared by the nineteenth century as a result of intensive hunting and rapid settlement expansion.

The spread of extensive farming in the nineteenth and twentieth centuries had devastating effects on the coastal grasslands and marshes of the north Black Sea.[2] In the first place, river flow regulation, the construction of huge water reservoirs and power stations during the early decades of the Soviet period, as well as the diversion of water for irrigation, deeply disturbed the natural water regime of the plains. Moreover, when crops replaced the natural grass vegetation, water and wind erosion dramatically increased and the formation of deep gullies and dust storms developed into major problems.

The north Black Sea region is generally poor in mineral deposits. Yet, the hills of the Donets ridge and the Crimean Mountains host several outcrops of mineral pigments, high-quality flint, ornamental stones and metalliferous ores. In prehistory, red mineral pigments were possibly obtained from the large cinnabar deposits at Nikitovskoe in the Donets ridge and the deposits of high-quality ochre at Izjum in the valley of Donets (Alexandrovskaja et al. 2000, Fig. 2). High-quality flint from the Donets ridge was a valued exchange item in prehistory; numerous quarries and specialized flint-working areas with huge quantities of production waste and semi-finished products dating to the fifth millennium BC have been identified near the sources, while hoards of long regular blades, retouched triangular points, prepared cores, and nodules of Donets flint have been recovered at distant sites (Rassamakin 1999, 103; 2002a, 49). Native copper and high-grade copper oxides (azurite and malachite) mixed with copper sulphides (e.g. chalcopyrite) are found in sandstones in the valley of the river Bakhmut (Černych 2003, 50 ff.; Tatarinov 1977, 193; Klochko et al. 1999). A major deposit of carnelian is situated in the Karadag ridge on the coast of the east Crimea (the "Carnelian bay"), while salt is plentiful in the estuaries of Dnepr and Bug and in the Sivash Lake (Thurmond 2006, 241; Multhauf 1978, 35). [3]

THE WESTERN COAST

The region between the mouth of the Southern Bug and the delta of the Danube acts as a narrow corridor of communication between

Southeastern Europe and the grasslands of Eurasia. It encompasses a zone of flat coasts intersected by deep river estuaries and numerous shallow lagoons that formed during the Holocene transgression of the Black Sea, when ancient river mouths were flooded and later nearly separated from the sea by sand dunes. The region comprises three major areas – the lakes Khadzibej and Kujalnik in the vicinity of Odessa, the Lower Dnestr with its estuary and tributaries, and the Danube delta with the adjacent floodplain and lagoon lakes.[4] The seasonally flooded, swampy banks of the rivers and estuaries sustain rich vegetation of reed beds, damp forests and wetland meadows (Marushevsky 2003). The watersheds are, in contrast, typical dry grasslands. The climate and soils in this region resemble those of the northern Black Sea.

The shores of the coastal lakes, and especially the vast delta of the Danube, are habitats with high biodiversity; the only strategic resource of the northwest Black Sea coast, however, is salt collected in late summer in the lakes and estuaries. Among the lagoons, the hyper-saline Lake Kujalnik was a major supplier of salt, large quantities of which were exported during the nineteenth century to the whole Ukraine (Ivanova and Ostroverkhov 2007, 248; for a description of salt extraction in the nineteenth century see Multhauf 1978, 22). Salt exploitation in the recent past was triggered by separation of the initial deep estuary from the sea by sand dunes during the late Medieval period. The salinity of the lakes during the Chalcolithic and Bronze Age periods, however, remains uncertain.

Behind cape Kaliakra, the monotonous grassland changes into a hilly countryside with steep landslide-shaped shores. Still further south, beyond the Balkan Mountains, the broken rocky coastline includes numerous headlands, bays, small coastal lakes, marshes and swampy and forested river mouths. In these southernmost parts of the west coast, the ridges of the 400 m high Strandzha upland touch the seashore at many places. The mean annual precipitation here reaches 500–600 mm, and the deciduous forests of the hinterland include sub-Mediterranean elements (Filipova-Marinova and Bozhilova 2008, 214). Important ecological niches in this part of the coastland are provided by the marshes and thick swamp forests along the lowest courses of small rivers such as the Kamchija, Ropotamo, Veleka and Rezovska. The Strandzha Mountains are rich in copper ore deposits and volcanic rocks (see Chapter 6).

THE COAST OF ANATOLIA

Extending from the Bosporus to the Caucasus and backed by the imposing ranges of the Pontic Mountains, the southern coast of the Black Sea is separated both geographically and culturally from the interior of Anatolia. The chain of mountains running parallel to the coast and rising to 4000 m in height effectively isolates the coastal societies from the interior and from each other.[5] The Black Sea littoral of Anatolia is a highland region. Its western half is rugged, with forested mountain slopes reaching to the water's edge at most places. Land communication along the coast is difficult. The only extensive lower area on the southwest coast, a plateau-like peninsula of rolling hills and small river valleys, is situated behind the ancient Greek colony of Sinope (modern Sinop). The central part of the coastline, in contrast, encompasses broad deltaic plains and extensive wetlands formed by two of the largest Anatolian rivers, the Kızılırmak and Yeşilırmak. Here, the relatively low mountainous countryside behind the vast reed beds, marshes, channels and lagoons around the deltas represents the only significant gap in the imposing barrier ranges and a major route of communication with the interior of Anatolia.

The climate of the coastal area between the Bosporus and the deltaic plains is characterized by mild winters and short humid summers and lacks a pronounced dry season. The prevailing northerly winds bring moisture from the sea, while the high mountain barrier behind the coast prevents the landward movement of humid air. Thus, the coast enjoys regular rainfall and luxuriant forest vegetation. The mean annual precipitation in the western part reaches 1000 mm, while the lower mountains behind the deltaic plains of the central part retain significantly less moisture and rainfall drops to 700–800 mm near Samsun (Höhfeld 1995, 117 f.). Running water is abundant and pastureland is year-round green but arable flatland is scarce, except in the drier central part of the coast – the only region with sustainable cereal cultivation. The ranges of the Pontic Mountains are very rich in deposits of non-ferrous metals (Fig. 1.2). Ancient mines are situated in the Küre Mountains; at Derealan in Tavşan Dağları, south of Samsun; near Kozlu and Gümüşhane, at Madenli near Çayeli; and at Murgul, south of Hopa (Wagner and Öztunalı 2000, 40–50).

East of the deltaic plains, the landscape changes dramatically. The imposing, foggy and heavily forested slopes of the East Pontic

Mountains fall abruptly toward the sea, creating an extremely narrow and humid coastal strip. Land access to the eastern part of the coast from the interior of Anatolia is nearly impossible, and at present the isolated mountain valleys of this region are inhabited by small ethnic groups with Caucasian backgrounds (Simonian 2007). The annual rainfall increases with increasing mountain height and reaches more than 2200 mm east of Rize (Höhfeld 1995, 112). With copious year-round precipitation, limited sunshine and an average humidity of 78 per cent, the "Black Sea climate" is here much more pronounced than in the western half of the coast. At higher elevations, the mountain slopes are covered with lush cloud forests ("Colchian forests") while today the lower areas are planted with hazelnut and tea shrubs. Apart from the cultivation of these two recent "cash crops", subsistence in the eastern part of the coast in the past included the exploitation of seasonal resources, for example gathering of wild plants, fishing, and transhumant milk pastoralism (see Chapter 7). Sheltered in the "rain shadow" of the mountainous Cape Yeroz, only the vicinity of Trabzon and the Değirmendere valley enjoy warm but less humid conditions. Even the cultivation of olives is possible in this narrow coastal zone (Hütteroth and Höhfeld

Figure 1.2 The Pontic Mountains south of Trabzon (picture by the author).

2002, 80). Moreover, Trabzon used to be the terminus of an important overland trade route to Iran passing through the major mountain crossing of Zigana.

Behind Batumi, the slopes of the Pontic Mountains border the extensive lowland of Kolkheti. Originally a vast sub-tropical wetland intersected by small stagnant rivers, peat bogs and lakes and covered with thick swamp forests, the largest part of Kolkheti was drained and turned into agricultural land during the 1920s and suffered massive deforestation (Marushevsky 2003). A very narrow coastal corridor, backed by the steep slopes of the Great Caucasus, connects Kolkheti with the grasslands of the Lower Kuban. A sub-tropical climate with high annual precipitation of up to 1400 mm, hot humid summers and mild winters characterizes the whole costal region between the Pontic Mountains and the Caucasus (Drozdov et al. 1992, 171). Abundant grazing and wild resources must have been available in the wetlands before their conversion into arable land, and the slopes of the Caucasus are very rich in mineral deposits (see also Chapter 4).

SEA LEVEL CHANGE AND COASTAL FORMATION

Studies of coastal geomorphology, especially the identification and dating of ancient terrace complexes, are the primary sources of evidence for coastline changes and sea level fluctuations.[6] High local variation, however, makes the interpolation of observations made in one area of the Black Sea to other parts of the coastline nearly impossible, while limited chronological control in the absence of accurate radiocarbon measurements and calibration significantly hampers the correlation of geomorphological data from different parts of the coast into a general curve of sea level fluctuations.[7]

The classical scheme for the Quaternary oscillations of the Black Sea has been developed by Fedorov (1972). Three successive stages in this sequence, dating to the Upper Pleistocene and the early Holocene, are of interest for the present study. During the "Neoeuxinian stage" of the Last Glacial Maximum the Black Sea was a freshwater basin with a Caspian fauna. The following "Old Black Sea stage" began with the rise of the sea level at the beginning of the Holocene (Bugazian-Vytyazian transgression). This transgression eventually led to a connection between the Black Sea and the Mediterranean. The "Old Black Sea Terrace", which formed at the end of the transgression, lays c. 10 m below the present sea level. In the course of the next stage, the "New Black Sea stage", the sea level continued to rise, reached the present level and even exceeded it. The "New Black Sea Terrace", which formed at the time of maximal rise, is situated 3–5 m above the present sea level.

Regional studies of geomorphology, lithostratigraphy, marine fossil fauna, tectonics, and archaeological data can potentially improve the chronological resolution of this general scheme. Two events are of major importance for the prehistoric period – the inflow of marine water into the Black Sea in the Old Black Sea stage and the remarkable sea level rise during the New Black Sea stage. During the Würm glaciation in the northern hemisphere, the level of the Black Sea fell to -90/-120 m and its connection with the Mediterranean was interrupted. The melting glaciers at the beginning of the Holocene caused global transgression, which eventually affected the "Neoeuxinian Lake". Mediterranean water penetrated into the Black Sea, leading to its salinization and a fundamental change in its flora and fauna.[8] The inflow of saline water was associated with the accumulation of sapropel deposits on the Black Sea shelf, which have been radiocarbon-dated to 7.5–7.1 ky BP (Ryan et al. 1997, 124; Atanassova 2005, 583).[9] It has been suggested that Mediterranean water poured into the Black Sea in a cascade, causing an abrupt rise of its level and a catastrophic drowning of the littoral (Ryan and Pitman 1999; see also the contributions in Yanko-Hombach et al. 2007). While the exact scenario and the speed of this momentous transformation remain hotly debated topics, it appears plausible that the ecological changes in the coastal zone affected both the native populations and the farming colonists that had arrived at the southern and western fringes of the Black Sea by the middle of the sixth millennium BC.

The second major event, the maximal rise of the Black Sea above its present level, is considerably more difficult to date. For the Bulgarian coast, stratigraphic observations based on cores from shelf and deep water zones of the Black Sea and from the lakes and estuaries in the present coastland suggest a particularly sharp rise with a peak at about 4720–4330 calibrated (cal.) BC (GIF 6034, peat, 5650±100 BP) (Filipova-Marinova and Christova 2001, 61; Filipova-Marinova 2007, 468 f.). By the second quarter of the fourth millennium, the sea level must have reached its maximum as documented by a hiatus layer with marine indicators at underwater archaeological sites in Lake

Varna and the bay of Sozopol. At Arsenala in Lake Varna, the sterile stratum was dated by means of dendrochronology to 3700–3180 BC (Filipova-Marinova and Bozhilova 2008, 214). Fragments of a sea terrace at an elevation of +5 m near Lake Varna and fossils of halophilous and thermophilous Mediterranean molluscan species in a terrace near the town of Beloslav may be related to the same event. This evidence suggests that at some time during the fourth millennium Lake Varna was transformed into a large sea bay, while Lake Beloslav had salinity close to that of the sea (Filipova-Marinova and Christova 2001; Filipova-Marinova 2007, 469 f.). By 3000 cal. BC, the sea had already returned to a lower level and new villages emerged near the previously drowned fifth-millennium sites. The regression continued during the first centuries of the third millennium BC (Filipova-Marinova 2007, 469 f.; also identified on the Caucasian coast – Larchenkov et al. 2009, 38).[10]

A NOTE ON MARINE BIODIVERSITY

Riverine runoff into the Black Sea supplies abundant nutrients during spring floods and transforms the lagoons, deltas and the shallow Sea of Azov into spawning grounds with immense bioproductivity.[11] Bivalve mollusks, mainly mussel (*Mytilus*) and cockle (*Cerastoderma*), and crustaceans (crabs, shrimps) are very abundant in these environments. Among the numerous species of fish, migratory fish have been highly valued and intensively exploited since Antiquity. With the fall of temperatures in autumn, the fish move onshore and assemble for migration to the south. In October and November huge shoals approach the coasts and fish can be caught in large numbers (Galtsoff 1924, 3 f.).

Large pelagic predators like the Atlantic mackerel (*Scomber scombrus*), bonito (*Sarda sarda*) and tuna (*Thunnus thunnus*) winter in the Mediterranean; migrate in April from the Aegean through the sea of Marmara to the Black Sea and move along the west and east coasts to the mouths of the large rivers and to the Sea of Azov for fattening and spawning.[12] Other species, especially the small planctivorous species hamsi (*Engraulis encrasicolus ponticus*) and Black Sea sprat (*Sprattus sprattus*), dwell permanently in the Black Sea and migrate between their wintering grounds near the south coast and spawning grounds on the north shore. The Black Sea mackerel (*Trahurus mediterraneus ponticus*) also winter on the south shore of the Black Sea but might also enter the Bosporus and the Sea of Marmara (Finenko 2008). A third group of migratory species, including sturgeon (*Acipenser*) and beluga (*Huso huso*), moves along the coast and upstream into the rivers for spawning.[13] Finally, common mullet (*Mugil cephalus*) migrates seasonally between the open sea and shore.

2

A Framework of Technology

A DEFINITION OF TECHNOLOGY

The question of what “technology” is may appear trivial. Contemporary Western scholarship defines it simply as the application of (scientific) knowledge to practical tasks.[1] Such a definition, however, disguises the normative nature of our notion of technology. Technology is not a delimited set of practices, an observable phenomenon which has absolute existence, but a concept similar to the notions of culture and society. To speak about society, Ingold notes, is not to refer to a thing but to make a claim (Ingold 1999, vii).

Modern Western gender ideology is perhaps one of the most obvious sources of claims about technology. The gendered division of labour in industrial societies envisions the association of technology and male work (see Dobres 2000, 14–16). Pacey (1983, 104) argues that “‘[t]echnology’ like ‘economics’ is a term conventionally defined by men to indicate a range of activities in which they happen to be interested”. Women’s occupations like food preparation, domestic storage and childcare, although perfectly in accordance with the formal definitions of technology, are not regarded as *technical* or at best are considered inferior. One might suppose that typical female work is downgraded because it involves less sophisticated equipment and skills. However, the marginalization of female technology is not simply a consequence of the technical background of women’s work. It is rather the claim of what technology is about, namely about hegemony over nature, which excludes soft female work from recognition (Pacey 1983, 104).[2] When technology is implicitly seen as a conquest against nature, most common female activities are indeed the antithesis of technology.[3]

Some popular claims about the nature of technology arise from modern capitalist notions of efficiency and goal-oriented actions. One result of the efficiency claim is a separation of practical and functional ("it works") from ornamental, magical or ritual ("it doesn't work") activities. The latter are then dismissed as non-technical, simply because they produce no direct material effect (for a critique see Pfaffenberger 1992, 501; Budd and Taylor 1995; Dobres 2010, 105). Yet many ethnographic cases show that style, ritual and magic are not only intrinsic to pre-industrial technology but also have a perfectly tangible function.[4]

Related to the preoccupation with efficiency is the modern fascination with the value of the fabricated object.[5] Emphasis on material tools and products in anthropology and archaeology leads to an implicit belief that technology is a matter of objects and not a matter of practice. Thus, some technologies are debased as "plain craft" merely because of their limited equipment or unsophisticated products.[6] Ingold (1999, ix; see also Lemonnier 1986, 149 f.) rightfully points out that such a boundary between people and things is artificial and performance by skilled humans is central to ancient technology. Technology encompasses not only material objects and knowledge but also action – gestures and movements which are internalized and habitual. Thus, it unites human culture (the acquired, learned abilities) with human biology (the use of the body).[7] It is not possible to understand ancient technology if one regards these two aspects as separate.

What, then, is technology? The illuminating position of Ingold (2001, 20 f.) provides a way of bridging the conceptual divide between biological and cultural, innate and acquired, body and mind in the study of ancient technology. Ingold argues for a study of technology as a skilled practice. Care, judgment, dexterity, continuous adjustment, and not just mechanical action, are essential to the process of making something (see also Keller 2001). Technology is not just a body of knowledge or the application of this knowledge; it rather unfolds in the process of making something, as the craftsperson responds to the changes she or he observes and feels as work progresses.[8] This view may appear exotic in the light of our experience with modern mechanized and objectified production, in which human skill and dexterity play an insignificant role. Yet the practitioner's engagement with the material has been observed and described in numerous ethnographic cases and seems to lie in the core of pre-industrial technology (see Ingold 2001; Keller 2001).[9]

ARCHAEOLOGICAL APPROACHES TO TECHNOLOGY

Change in material culture, and hence technological change, is one of the pivotal topics in the heterogeneous field of contemporary prehistoric archaeology. Since the early history of the discipline, progressive and instrumentalist views of technology have been very prominent in archaeological thinking. As Pfaffenberger has demonstrated, the basic premises on which these views are grounded owe more to the attitudes and the common sense of European Modernism than to any empirical evidence. They include, in the first place, the belief that technological innovation is caused by necessity: technology develops to eliminate needs. Moreover, it develops autonomously according to its own inherent logic: there is a certain best, meaning most effective, technical solution for every need. Third, technology is cumulative: more "advanced" technologies are also more efficient and are eventually adopted. Thus, technology inevitably develops in a progression from simple to complex.[10]

The presence of these preconceptions in prehistoric archaeology can be briefly illustrated by the work of Gordon Childe, one of the most influential European prehistorians of the twentieth century. Childe believed that technological innovations improve human life by meeting perceived human needs and extending human control over nature (see e.g. Childe 1951, 8 f.). He assumed that there are logical reasons for certain technological developments, for example that metal is intrinsically superior to stone by being labour-saving in the manufacture, use and maintaining of tools (Childe 1944, 9). Childe argued that the development of human tools has been cumulative and progressive and that archaeology can contribute to the reconstruction of a "general line of progress" in the development of technology (Childe 1955, 187). His views of technological, particularly metallurgical, change were extremely influential. In the study of ancient metallurgy, as Budd and Taylor (1995) have shown, Childe's stage/age conception and his equation of technology with science and progress retain their paradigmatic importance even today.

The decades after World War II witnessed growing interest in generalization and reduced attention to the study of material culture in archaeology. One very popular framework for "objective" generalizations became cultural ecology (see Epstein 1993, 35 f., with discussion and references). In the discussion about technological change, the old premises were now integrated into more elaborate explanations. The idea of need-driven technological development, for example, was consistent with the concepts of cultural ecology.[11] Technological innovation, according to the ecological explanation, is brought about to solve problems created by external factors, for example, environmental deterioration or population pressure (see Pfaffenberger 1988, 243, with references). It is, indeed, the main means of adaptation to such adverse conditions.[12] Since superior efficiency means adaptive advantage, the most efficient technological solution is inevitably adopted (the efficiency argument). This explanation did not really move away from the old view of "primitive Man dominated by nature". It still tacitly advanced the idea of struggle against the constraints of nature and, indeed, of human domination over nature, now (pseudo) scientifically justified as adaptation.

These prevailing positivist and progressive explanations of technological change in the social sciences have been subject to sustained criticism (see MacKenzie and Wajcman 1985; Lemonnier 1986; Pfaffenberger 1988, 1992; Ingold 1980, 8 f.; Ingold 1990). The most coherent critique has been put forward by Pfaffenberger, who, by means of empirical ethnographic evidence, convincingly refuted the main premises of need-driven, progressive and cumulative development of technology.[13] Most obviously, need is defined by culture and not by nature. There are indeed universal human needs, but the constraints imposed by nature are very loose and the range of solutions very broad, as demonstrated by the astonishing diversity of human material culture. Second, ethnographic studies show that there is a wide range of options and not a single "correct" and most efficient solution to a certain problem.[14] Thus, the view of technological development as autonomous and cumulative is a misconception. The success of a given technology is socially controlled and the laws of society rather than the objective laws of nature command efficiency. For example, ritual and religion can play an essential role in the success and "productivity" of a technological activity.[15] Adaptive success arises only when technological and social resources are put to work together (Pfaffenberger 1992, 497). Pfaffenberger expressed strong reservations against the expectation of predictable change. In fact, experience shows that expected improvements are not automatically met with the introduction of a new technology. Rather, a new range of options opens, only some of which will be exploited (Pfaffenberger 1988, 240).

Instead of the instrumentalist view, Pfaffenberger advanced the concept of a sociotechnical system derived from the field of history and sociology of technology. To understand technology, he argues, one must consider not only the material aspect of production but also the social, ritual and political resources that shape it. A sociotechnical system combines "knowledge, ritual, artefacts, techniques, and activity". As an illustration for a successful sociotechnical system, Pfaffenberger (1992, 498, 509) used the example of Portuguese naval expansion of the fourteenth and fifteenth centuries, which arose not simply from the introduction of a new type of vessel but depended on the complex relationships of mariners and ship builders, kings and queens, merchants, Muslims and gold, cannons, maps, winds and sails, instruments and measurements. This argument has the potential to change the way archaeologists think about technology but promises little practical application for the field of prehistoric archaeology. As Pfaffenberger himself acknowledged, the immense loss of knowledge makes the recreation of past sociotechnical systems in most cases virtually impossible (Pfaffenberger 1992, 508).

In contrast, the *chaine operatoire* analysis and the study of technological choice, developed by French cultural anthropology, proved well suited for the interpretation of past technology as a part of social practice. In the past decades research on technological choice developed into a veritable trend in archaeology (e.g. the studies of Sillar and Tite 2000; Epstein 1993; Dobres 2000; Lemonnier 1993; Dobres and Hoffman 1999; Schiffer 2001; Stark 1998; for further references see Sillar and Tite 2000, 9). The proponents of this approach maintain that technology is not an autonomous force situated outside human society and controlled by physical laws (as opposed to human decisions). They reject the notion that only material constraints have relevant and "real" effects on the development of technology, and that technology is a purely practical activity. Rather, technical decisions are met both by "objective" practical logic and by "subjective" cultural logic.[16] There are often several possible technical solutions for a particular problem, but only a few of them are considered acceptable, and the preference for a particular solution is regulated by cultural perceptions of what is appropriate (see e.g. for pottery Gosselain 1998; Dietler and Herbich 1998, 236–244; Sillar 1997 and for metallurgy Epstein 1993; see also Sillar and Tite 2000, 9, with examples and references).

Yet, trivial as they may appear, how can the student of technology correctly recognize such cultural choices? The *chaine operatoire* approach, an analytical tool designed primarily for recording (or reconstructing) technological activity as a sequence of steps, including both objects and gestures, is in fact the basic precondition for a study of technology and technological choice as a social phenomenon. Its importance was well demonstrated by Lemonnier (1992, 25–50), who argued that only the analysis of whole operational sequences can reveal the points where choice is possible (and not prevented by physical constraints), the interdependency of decisions, and eventually the motivations and preferences behind particular choices.[17] Finally, the *chaine operatoire* approach can potentially recover elements of ancient cognition, a possibility exploited more widely in recent decades, and, by emphasizing physical action and gestures of the body, introduce the previously invisible ancient technicians (and thus human experience) into the study of technology in the past.

INNOVATION IN TECHNOLOGY

Technical innovation is inherently connected to desirable and beneficial change. In modern terms, innovation involves the implementation of an idea in practice, leading to an improvement in value, productivity or efficiency. A more general understanding admits that a way of doing things must not be actually new in order to be considered an innovation, but it has to be perceived as new by the adopter (Rogers 2003, 12). It is important to emphasize that innovation is not equal to or inextricably connected to invention. Innovation can take place as a gradual, largely uncontrolled and contingent process. MacKenzie and Wajcman (2003), for example, draw attention to the notion of technical change through the gradual accumulation of new details as opposed to the inspirational notion of invention. Sociological research on innovation shows that, even in the age of industrialization, new technologies did not emerge from "flashes of disembodied inspiration". Innovations instead developed from searches for solutions in the frame of an existing technology through new combinations and minor improvements.[18]

Technical change can also involve a gradual process, in which innovation unfolds in the course of skilled performance in manufacturing and use, as "feedback from experience" (MacKenzie and Wajcman 2003, 8 f.). Furthermore, as pointed out by van der Leeuw (1990), there are also processes of unintentional innovation, for example the "cultural non-replication". Van der Leeuw maintains that technical performance is an act of re-creation involving change (van der Leeuw 1990, 96; see also Ingold 2010, 98). Since exact replication is never possible, the difference between repetition and innovation is not a qualitative one. Both repetition and innovation involve change, and the latter becomes a special case only from a posterior perspective. To understand how such forms of gradual innovation come into being in past technical systems, as van der Leeuw aptly emphasized, archaeologists have to give up looking back into the past in search of origins. Rather, the student of technical change has to "re-create" innovation by adopting the perspective of the practitioners looking forward into the future, with the choices and constraints which were available to them (van der Leeuw 1990, 96).

A further source of change in technology is the so-called "re-invention" (Rogers 2003, 180–189), the stepchild of innovation research. Re-invention usually occurs during the early implementation of a new technology, when the adopters reject some elements of the innovation or provide it with completely new meanings and functions. Re-invention often takes place when little contact and information are available to the adopters, especially in the case of a complex or unsuitable innovation. The spread of the horse in Native American culture in the Great Plains, for example, involved elements of re-invention. Ethnohistorical accounts testify to a rapid adoption of the horse and the entire technical system associated with the practice of riding (including elements of riding gear). The horse-pulled travois, however, was an original contribution of the Native Americans. The horse easily replaced the dog as a beast of burden – in fact, already at the time of their first encounters with the new exotic animal, the inhabitants of the Plains referred to the horse as the "big dog" (Rogers 2003, 188; see also Ewers 1955, 16).

Technological innovation is a complex phenomenon shaped by technological, economic, political and cultural factors. While the role of economic and cultural factors appears obvious, the importance of the technological context needs some explanation. The process of technological change, MacKenzie and Wajcman (2003, 9) argue, is actively shaped by the existing technology. The authors comment on two aspects of this technological shaping of technology: the notions of a technological paradigm and a technological system. A technological paradigm is a concept or solution extended from one realm of technical knowledge to a new area. For example, the technique of coiling in pottery production apparetnly originated in basketry, while twill patterns that developed in matting were subsequently transferred to loom textiles.[19] However, MacKenzie and Wajcman stress that the use of a paradigm does not pre-determine the outcome. By creatively using the same paradigm in different contexts, different innovations can come into being. Furthermore, the areas of technical knowledge and experience are not separate but closely interconnected in a "technical system". For example, the technology of the automatic washing machine can exist only if it is integrated with several other technologies of electricity, water supply, and drainage.[20] In prehistory, the early techniques of casting could be practiced only in connection with the technology of fired clay; copper smelting was possible only with charcoal as a fuel, and an absolute precondition for the "invention" of the wooden four-wheeled wagon must have been the presence of a suitable technology for animal traction. It is obvious that a new component of a technical system, an innovation, has to integrate into the whole. This necessity constrains the possibilities to introduce changes or, indeed, can preclude the development of a specific technology. For example, an agricultural innovation like the ard is not plausible in a cultivation system based on dibbling, since ards make furrows and not holes.[21]

TRANSMISSION AND ADOPTION OF TECHNOLOGY

The diffusion and adoption of innovations are social processes. The anthropological record suggests that face-to-face communication and relations of kinship are two of the most significant mechanisms for transmitting technical innovations among both craft practitioners and consumers. Keller and Keller (1996), for example, have observed by active participation and practice of the craft of blacksmithing that contemporary artist-blacksmiths develop their skills and knowledge through regular personal contact, exchanges of information and comparisons of their own work with the products of others, since "no one is self-taught". Involvement in networks of practitioners sharing values and standards is crucial for their ability to enlarge and transform the craft. In a different context, Acheson and Reidman (1982) established that close interactions in social and political networks, especially in kin networks, play a major role for the spread of innovations among fishermen. Regular contact with close kin with the same occupation increases dramatically not only the amount and accuracy of information available to a fisherman, but also the likehood that he adopts an innovation (Acheson and Reidman 1982, 550–552; see also Burt 1980, 330).

Useful for understanding the spread of an innovation among consumers are the concepts of opinion leaders and critical mass, developed by modern product marketing and diffusion research (Rogers 2003, 343–362). Opinion leaders play a crucial role at the start of the process of diffusion by influencing the behaviour of their peers in the network of social relations. With increasing number of adopters, the innovation is progressively perceived as beneficial. After some 5 to 20 per cent of the participants have adopted the innovation, further diffusion becomes self-sustaining (it has passed the "critical mass"). A simple example of the mechanism of critical mass is the spread of clothing styles and fashionable items in contemporary Western society.

Numerous factors can restrict the adoption of an innovation. One of the most significant economic factors for adopting a technical innovation in non-egalitarian societies is apparently wealth. Cross-cultural studies suggest that both individuals who are too poor or very affluent are less likely to introduce an innovation into their major activities. Members of the middle ranks, aspiring higher status and influence, are among the most eager early adopters (Geselowitz 1993, 241 f.). Moreover, the high costs associated with adopting some technologies can delay and even prevent the spread of a technical improvement. For example, the adoption of animal-based transport in some regions of present-day Africa is impeded by a shortage of critical spare parts and a lack of experience in repairing carts (Dennis 1999).

Technical factors are always central to the process of adopting innovations. A higher potential for re-invention, for example, leads to improved sustainability, and faster and wider adoption (Rogers 2003, 183). Moreover, some technologies can be introduced successfully only as a part of a technological cluster of interdependent innovations (Rogers 2003, 14 f., 249 f.). For instance, the package of innovations in cereal cultivation, which led to the *Green Revolution* in developing countries between the 1950s and 1970s, included not only improved high-yielding varieties of rice and wheat but also new practices of irrigation and sowing and the extensive use of new agrochemicals. Only the adoption of the entire cluster at once warranted the maximum production increase. The notion of a technological cluster may be useful for understanding the spread of similarly "revolutionary" changes in agriculture in prehistory, for example the introduction of animal traction in tillage and transport.

The parts of a technical sequence differ in their potential to incorporate innovations. Gosselain (2000), for example, pointed out that some stages of pottery production, such as the preparation of a clay body and its firing, are essentially based on recipes and can be altered easily by potters who occasionally exchange information with other craftspeople and observe their work; many simple decoration techniques also can be introduced easily through imitation. The skills of vessel shaping, however, are acquired only through very close and intensive interactions between the master and apprentice, until all necessary gestures are internalized by imitation and repetition. Such habits are very difficult to change in order to integrate innovations.[22] Moreover, in stages of the production which leave visible traces on the finished product, for example colour, decoration and surface, the potters are more likely to be influenced in their technological choices by the tastes of the consumers and are more willing to accept modifications. Shaping methods, in contrast, can be rarely observed on the finished vessel and have little importance for the consumer (Gosselain 2001).

A limiting factor that has been unduly neglected is the relationship between an innovation and its adopters. Incompatibility with the worldview or taste of the adopter can be a decisive hindrance for diffusion even when all economic and technical preconditions are met. For example, the wide adoption of the potato in Ireland and Scotland was impeded for a long time after its first introduction. Since potato propagation and processing are easy and need no additional equipment or investment (actually, the investment needs are much lower than for cereals) and the plants thrived, there were no economic or technological obstacles for its fast incorporation into agricultural and culinary practices. Yet cultural reasons, mainly the taste of the new food, prevented potato cultivation until starvation forced the peasant population in the mid-eighteenth century to grow it as a substitute for the exorbitantly expensive cereals (Leach 1999). An archaeological assessment of the crucial role of worldview in technological change has been attempted by Epstein (1993) in his study of native metallurgy in Peru. Inca metallurgists, while conceptually able to "invent" bellows (since the principle of the bellows was apparently understood and used in ritual contexts), preferred to exploit only wind- and lung-powered draughts. The introduction of bellows would have removed major constraints in smelting. For example, by rejecting bellows Andean metallurgists were never able to sustain the conditions necessary for iron smelting and had to put up with unsuccessful and incomplete copper smeltings. Epstein hypothesizes that the Andean technology of smelting expressed a general worldview in which human breath (and natural wind) was of primary importance and the fundamental idea of blowing as directing the universal flow of life force has effectively impeded the introduction of the "mechanical breath" generated by bellows. The metallurgical technology brought by the Europeans was incompatible with the native Andean worldview and was not incorporated into the local technological practices. Soon after the Spanish Conquest the native technological tradition disappeared and was replaced by the foreign.

OUTLOOK

The following chapters of the book focus on technology in the different parts of the Black Sea littoral during the prehistoric period. In the first place, I consider the group of technologies that are most essential for human survival, that is, the technologies of acquiring food. Two popular misconceptions are ingrained into the archaeological understanding of food-getting technology. One of them is its reduction to the procurement of mere necessities, "the myth of subsistence" in the words of Sherratt (1999, 13 f.), who convincingly argues that the picture of prehistoric and "primitive" societies living on bare necessities is simply a reflection of present-day economies in the developing world. Prehistoric food getting did not need to be and was certainly not limited to strategies of securing the bare minimum of calorific staples for local consumption, and traditional societies, impoverished by contemporary economic globalization, provide a poor model of the distant prehistoric past. Many aspects beyond simple nutrition deserve serious archaeological consideration, for example the cultivation of variety crops (such as plants used as mood-altering substances, medicines, stimulants, condiments and spices) and especially of "cash crops". Cash crops are plant species requiring particular labour-intensive processing (rather than the immediate processing in the home by cooking) which creates added value and transforms them into valuable goods suitable for exchange (see Sherratt 1997a, 226, note 5).

A more significant misunderstanding is the popular conceptualization of food acquisition, particularly in food systems based on domestic plants and animals, as production. The modern idea that humans can "make" their food by means of technology has been rightly questioned by Ingold (2000, 81). Researchers seem to overlook the obvious fact that crop and animal husbandry is a biotechnology which only assists the growth and reproduction of living organisms in the limits of the natural order, "a process of growing, not making". Animals and plants are not produced, they are taken care of; grain, milk and meat are not made, they grow. This is not just a trivial matter of wording – there is indeed a fundamental difference between growing things and making things. In Ingold's (2000, 81) words, "The farmer, and for that matter the raiser of livestock, submits to a productive dynamic that is immanent in the natural world itself, rather than converting nature into an instrument to his own purpose".[23] Thus, from a technological perspective, the transition from food-collection to food-growing seems much less revolutionary than archaeologists traditionally assume. Hunting and gathering and simple farming do not differ radically in terms of tools, knowledge about attributes and behaviour of living organisms, growing cycles, ritual competence, and therefore in skills and techniques of manipulating genetic stock and its habitat. It becomes obvious that the differences lie not in technology and concepts but merely in the *scope* of involvement with the natural process of growth (Ingold 2000, 86 f.).[24]

The second major area of pre-industrial technology discussed in the following chapters encompasses the technologies of the materials, or the actual production (or making) of things. It is important to stress that making principally employs knowledge and action on the level of substances (of appearance, feel and smell) and not on the level of chemical structure, and it therefore would be incorrect to transfer modern ideas of scientific inquiry and experimentation to traditional crafts. Craftspeople depend on their bodily experiences of what happens to substances when treated in a particular way, "struggling with materials" (Ingold 2010, 94) quite like alchemists.

Manipulating substances by the mechanical and chemical actions of striking, pulling, pressing, cutting, grinding, combining, mixing and heating, traditional craftspeople progress toward a result which is anticipated but not fully controlled; they follow the materials (Ingold 2010, 96).

A group of fundamentally important transforming technologies relates to food and cooking. Culinary technologies involve mechanical (e.g. grinding and crushing of grains, sieving and filtering of flour, pressing of vegetable oils), chemical (basically heat treatment) and bio-chemical (e.g. fermentation or enzyme coagulation) changes of organic substances. They seek to make foodstuffs safer and more digestible, and thus to obtain more energy from a mouthful of food. A second group of manufacturing technologies entails combining and transforming raw materials, supplied by nature, into artefacts (Ingold 2000, 85). Transformation can take place by mechanical manipulation, for example through assembling and rearranging (fibres), or through strokes and pressure (stone, clay, metal). Moreover, chemical transformation, especially chemical change by high heat generated by carbon combustion, is fundamental for the processing of inorganic substances, for example the conversion of clay into ceramics, minerals into metals, or quartz into faience and glass.

3

Eurasia: The Neolithic Prologue

The final phase of the last Glacial period began around 18.000 years ago. The gradual global rise of temperature and precipitation was accompanied by major changes in vegetation and fauna and called for human adaptations, the most fundamental of them being the transformations in food procurement. This major adjustment affected all foraging societies across Eurasia. In southwest Asia, however, it gave rise to new relationships of dependancy between humans and plants and animals with far-reaching economic and social consequences.

The emergence and spread of farming represents one of the pivotal questions of European prehistoric archaeology. The formidable body of literature on this topic that has accummulated since Childe's (1928) invention of the concept of the *Neolithic Revolution* is beyond the scope of the present study. Instead, this chapter focuses on the technological aspects of the farming transition and provides an overview of the technological changes that took place in southwest Asia from the end of the Last Glacial Maximum to the full establishment of the "Neolithic package" and the beginning of its unprecedented expansion around 7000 cal. BC. This is followed by a review of the evidence for the spread of farming technology and a series of associated innovations in the Black Sea littoral in the sixth millennium BC.

TECHNOLOGICAL DEVELOPMENTS IN SOUTHWEST ASIA

Farming Technology

Farmers intervene into the life cycles of plants and animals, but so do foragers. In fact, hunting and gathering and initial farming do not differ radically in terms of tools, skills and techniques of manipulating genetic stock and its habitat. Neither is there any deep conceptual divide between the two strategies of exploiting the natural environment, both being essentially the manipulation of biological systems in the narrow limits set by nature. The difference resides merely in the *scope* of involvement with the natural process of growth (Ingold 2000, 86 f.).

Through cultivation and controlled breeding plants and animals undergo genetic changes, some of which significantly reduce their ability to survive without human support. [1] The ears of wild cereals and the pods of wild pulses, for example, shatter to release the mature seeds and thus enable plant propagation. Seed dormancy, a genetically controlled trait ensuring that as little as 10 per cent of the seeds (for some legume plants) germinate after sowing, is another key adaptation to maximize plant survival (Doebley et al. 2006). Complex sexual and social behaviour, a genetically controlled breeding season and a specific number of offspring guarantee the successful reproduction of wild animals. Such features do not suit human needs and are (unintentionally) selected against in populations managed by humans. Domestic plant and animal populations require human support and protection such as soil tillage, seed sowing, weeding and fencing off cultivation plots for plants; feeding and protecting young, pregnant and lactating animals; controlling population structure to prevent conflicts and ensure animal reproduction; and in some cases stalling and provisioning animal fodder outside the plant growing season. In a purely technological sense, however, initial farming is not a new revolutionary system of "food production". It is rather a relationship of stronger interdependency between humans and their plant and animal sources of food.

The development of domestic plant and animal species is well documented in the archaeological record of southwest Asia. The archaeobotanical evidence suggests that the cultivation of cereals began in the PPNA (Pre Pottery Neolithic A) period, or the tenth millennium cal. BC (Fig. 3.1).[2] Some cultivation lines of the tenth and ninth millenniums BC were abandoned, for example oats and rye did not develop into dietary staples (Weiss et al. 2006, 1609; Weiss and Zohary 2011). The earliest morphologically domestic plant staples were einkorn and emmer wheat, which appeared in early PPNB (8700–8000 cal. BC).[3] Domestic barley and lentils have been recorded from mid-PPNB (8000–7500 cal. BC) onwards.[4] Savard et al. (2006, 191) point out that these "founder crops" did not necessarily develop from the main staples of the pre-agricultural period. The preference for wheat, barley and a few species of legumes was probably the result of their susceptibility to cultivation.

According to current evidence, animal domestication took place several centuries after the appearance of the first domestic grain plants. The earliest bones of morphologically domestic animals occured at sites of the PPNB period. In the course of the early and mid-ninth millennium cal. BC evidence of herding sheep, goats, pig and cattle increased throughout southwest Asia. By 8500 cal. BC bones of domestic sheep and goats were attested in southeast Anatolia (Cafer Höyük, Nevalı Çori, and Çayönü), in the Zagros region (Nemrik 9), and on Cyprus; in the first half of the eight millennium cal. BC herds of sheep and goats were already found widely in southwest Asia (Conolly 2011). The earliest bones of morphologically domestic pigs and cattle date to the early to mid-eighth millennium BC (mid-PPNB).[5] In the second half of the eighth millennium cal. BC pig and cattle became ubiquitous throughout southwest Asia (Conolly et al. 2011, 543).[6] The progenitors of the PPNB domesticates were not necessarily the most important food animals exploited by Neolithic people, but rather the most fecund and gregarious among them. Gazelles and onagers, the two major food species of the PPN period in southwest Asia, did not develop into domesticates. At Abu Hureyra, for example, wild gazelles were replaced by domestic goats and sheep as a main source of food only around 7400 cal. BC (Akkermans and Schwartz 2003, 73).

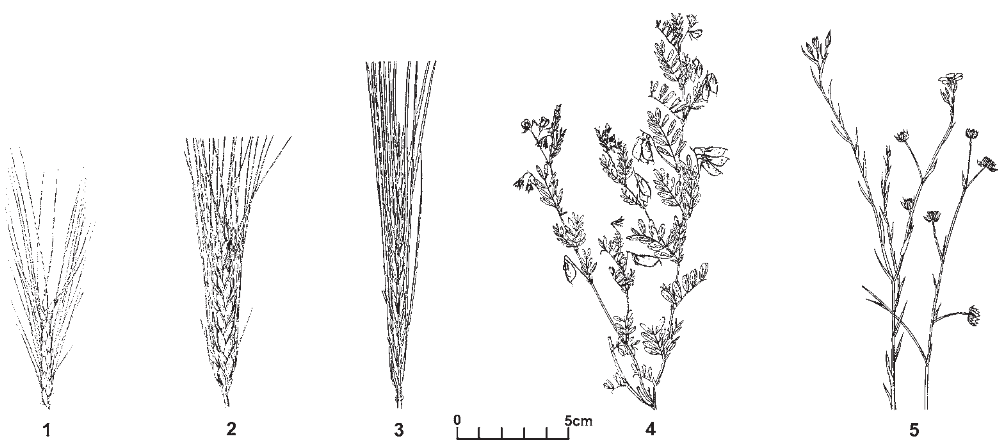

Figure 3.1 The wild progenitors of the southwest Asian founder crops, einkorn *Triticum monococcum* subsp. *boeoticum* (1), emmer *Triticum dicoccum* (2), barley *Hordeum vulgare* subsp. *spontaneum* (3), lentils *Lens culinaris* subsp. *orientalis* (4) and flax *Linum usitatissimum* subsp. *bienne* (5). After Zohary and Hopf (1993).

The technology for handling plants and animals developed long before the first cultivation attempts of the PPNA period and was certainly not "invented" to enable domestication, yet the establishment of domestic crops in the PPNB was accompanied by significant adaptations in farming tools. While straight harvesting knives and sickles were widely used during the Natufian and PPNA periods (12.600–8.700 cal. BC), the mid-PPNB period saw the appearance of sickles with curved shafts (Fig. 3.2). Ibáñez et al. (2007, 161) attribute this new shape to a new harvesting gesture that was suitable for domestic cereals with non-shattering ears.[7] The emergence of the first stone hoes in the mid-PPNB period also might have been related to the increasing dependence on domestic crops. Ibáñez et al. (2007, 161) hypothesize that sedentary farming involved the repeated use of cultivation plots, an accompanying decrease in productivity, and thus a need for more thorough tillage and for more robust, stone tillage implements.[8]

Finally, the PPNB period possibly witnessed the occurence of the threshing sledge. There is no point in threshing wild grasses, since their mature ears are brittle and disarticulate spontaneously upon drying. The ears of domestic cereals, however, remain intact and the spikelets have to be separated by pressure, for example by treading or by pounding with heavy wooden implements (Anderson 1994, 320). Microwear studies of PPNB flint tools attest to their use

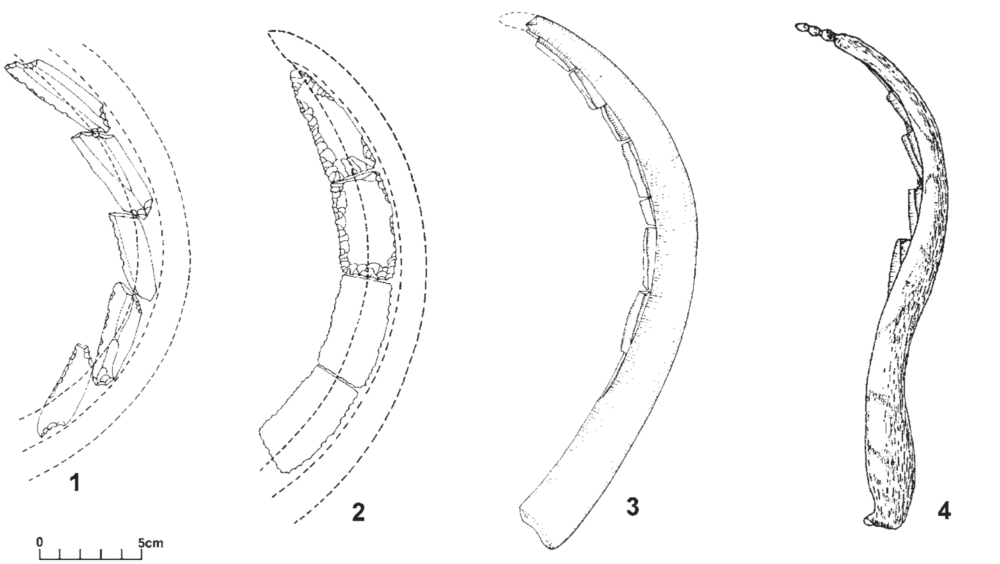

Figure 3.2 Composite sickles with curved shafts from the mid-/late PPNB sites at Tell Assouad (1) and Tell Ramad II (2), and from the late-seventh/early-sixth-millennium cal. BC sites Hacilar VI-II in West Anatolia (3) and Karanovo I in Thrace (4). After Cauvin (1983, Fig. 5) and Georgiev (1958, Fig. 2).

as inserts in a threshing sledge (see Anderson 1994; Ataman 1992). Anderson has suggested that the significance of the sledge lay not just in the breaking of the ears, but also in the chopping of the stalks into fine pieces. Chopped straw is a valuable raw material, both as animal fodder and as filler in mudbrick production.[9]

Food Technology

The principal techniques of treating grain foods were developed before the onset of domestication. The storage of grain, for example, began in the Natufian period and became increasingly sophisticated in the PPNA. Large granaries dating to 9250–9125 cal. BC have been investigated at Dhra' near the Dead Sea (Kuijt 2009), and another very large granary of this period was recovered in a house at Gilgal in the Jordan Valley. The latter held 260.000 grains of wild barley and 120.000 grains of wild oats (Weiss et al. 2006).

Cereal grains contain mainly starches: they are microbiologically stable, storable and well suited as a major dietary source of calories. Unfortunately, humans do not digest starches well. The mechanical, biochemical and thermal processing of grains are indispensable to diets based on cereal foods. The first stages of grain processing involve dehusking and cracking by pounding with mortar and pestle and starch extraction by grinding with slab and hand stone. The use of mortars and grinding slabs for processing grains in the Levant goes back to the Upper Palaeolithic. The site of Ohalo II on the shore of the Sea of Galilee, a camp dating to the Early Epipalaeolithic (21.500–20.500 cal. BC), provided waterlogged deposits containing charred grains of wild barley and emmer and grinding tools. Starch grain studies of a basalt grinding stone demonstrated its use for the processing of wild barley (Piperno et al. 2004).

In her study of the development of ground stone technology in the Levant, Wright (1993) recognized a notable rise in the numbers of ground stone tools in the Early Natufian in comparison to the Epipalaeolithic, the most frequent of which were the mortars and pestles. Obviously, grain processing by pounding and grinding was routine many centuries before the appearance of domesticated cereals. The PPNA witnessed a sharp increase in grinding slabs at the expence of mortars. During the PPNB the proportions of different tools remained stable, but there was a significant increase in their size and diversity (Fig. 3.3).

The next necessary step in the processing of grains for consumption involves the thermal treatment of starch. Boiling pounded seeds can be sufficient to promote starch gelatinization (rupturing of the starch molecules), but baking has clear advantages. Baking not only produces a microbiologically stable product but also can increase the dietary energy obtainable from grains by up to 72 per cent (Piperno et al. 2004, 671). While Piperno et al. assume that the dough was roasted in a hearth-like structure at the palaeolithic site of Ohalo II, the earliest special installations which can be interpreted as bread ovens appeared in the mid-PPNB (Haaland 2007, 174).[10]

Finally, the consumption of milk was apparently widespread throughout southwest Asia by the seventh millennium BC. Analyses of absorbed organic residues from early pottery provide the earliest evidence for the use of dairy products (Evershed et al. 2008). Certainly, lipid analysis of pottery does not provide evidence for the beginning of dairying, but rather for the period in which it became archaeologically visible. The development of milking and milk

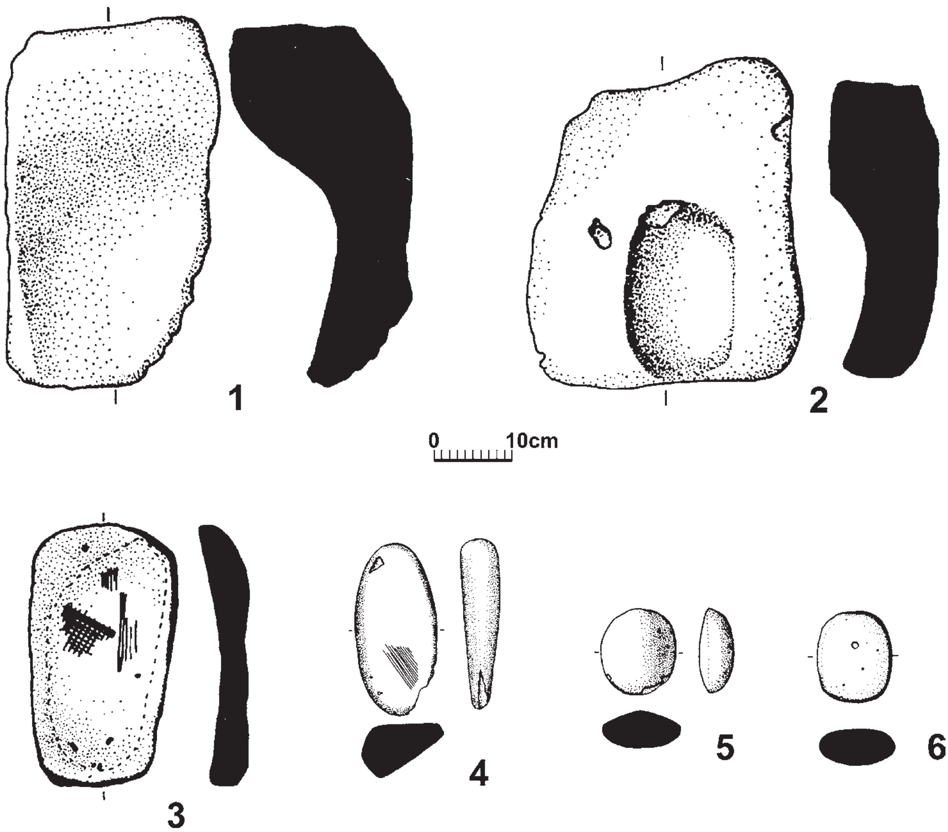

Figure 3.3 PPNB stone mortars, grinding slabs and handstones from Beidha (1.2, 4.5) and Wadi Jilat (3, 6). After Wright (1993, Fig. 1).

consumption most probably preceded the westward migration of farmers into West Anatolia and southeast Europe in the seventh millennium BC and was indeed one of the preconditions for the unprecedented expansion of farming in this period.

Textiles

The cultivation of fibre plants began, according to current archaeobotanical data, in the PPNB period. Linseed from Tell Mureybit, dating to 8900–7900 cal. BC, may represent the oldest indisputable evidence of the use of flax (Weiss and Zohary 2011, with references). Flax seeds occurred throughout southwest Asia in the second half of the eighth millennium cal. BC (mid-PPNB), though morphologically domestic flax has not been attested before the late PPNB, around 7250 cal. BC.[11] Genetic studies suggest the domestication of the large-seed variety of the plant and thus the primary use of flax as a source of plant oil rather than for its fibres (Allaby et al. 2005). The earliest direct evidence of the use of flax fibres for weaving are the remains of a woven linen fabric from Nahal Hemar on the Dead Sea, dating to the beginning of the seventh millennium cal. BC (Schick 1988).[12]

The fabric from Nahal Hemar indirectly attests to several advanced textile technologies such as spinning with a spindle and weaving on a (heddle) loom around 7000 cal. BC. Finds of spindle whorls and loom weights are, however, absent in the pre-pottery period. Clay spindle whorls occur at sites of the early Pottery Neolithic throughout southwest Asia, Anatolia and the Balkans, but remained relatively rare prior to the fifth millennium BC (Çilingiroğlu et al. 2004, 49 f., Fig. 33; see also Petrova 2011, 93). The occurrence of the earliest clay loom weights tells a different story. Judging from the large numbers of weights at numerous sites in Anatolia and the Balkans during the seventh and sixth millenniums BC (Çilingiroğlu et al. 2004; Petrova 2011, 132–137, with summary for the Balkans) and their absence to the east of this region, the warp-weighted (vertical) loom may have been "invented" only after the PPN period, most probably among the early Pottery communities of Anatolia.

Lithic Technology

The PPNA witnessed major changes in lithic technology from microlithic tools and flakes towards larger cores and more regular blades. Among the most significant changes was the emergence of the *naviform* core-and-blade technology (Quintero and Wilke 1995, 19; Ibáñez et al. 2007, 162). Naviform cores are preformed opposed-platform cores with a characteristic boat shape, used for detaching large blades with pre-determined size and form by direct percussion. This lithic technology came into general use in the PPNB and flourished for a relatively short period in the mid-PPNB, when standardized straight blades eventually replaced tools on flakes and microliths (Quintero and Wilke 1995, 19). Quintero and Wilke argue that its unprecedented success was related to the establishment of sedentary farming and the need for standardized blades as blanks for tools, especially for projectile points and sickle inserts. Another new specialized lithic technique, pressure flaking, spread in the eighth millennium cal. BC (Ibáñez et al. 2007, 162).[13]

The predecessors of the Neolithic ground stone technology occured in the Upper Palaeolithic (see Piperno et al. 2004). The most important neolithic "novelty" was possibly the polished stone axe, a tool that was introduced in the PPNB and quickly replaced the traditional crude flint adzes (*herminettes*) of the Epi-Palaeolithic and PPNA periods. Among the earliest finds are the polished axes from the early PPNB site Tell Qarassa (Ibáñez et al. 2010). PPNB stoneworkers manufactured a wide variety of other stone artefacts, for example various containers, beads, pendants and figurines. Ibáñez et al. (2007, 157) observed a notable sophistication of stone drilling technology in the course of the Epi-Palaeolithic and PPN periods in the Levant. Mechanical drilling was used along with hand drilling during the Khiamian; from the PPNA onwards mechanical drilling became predominant, and the late PPNB period saw the appearance of sophisticated drilling techniques that involved the use of various abrasives (Fig. 3.4).

Pyrotechnology

Lime plaster is an artificial material manufactured by a sophisticated process of chemical transformation. Upon heating at 800–900 °C limestone, a hard rock composed of calcium carbonate, decomposes to quicklime (calcium oxide) powder. By adding water, quicklime powder is hydrated to portlandite (calcium hydroxide), a substance with the consistency of a paste that can be mixed with a filler material (e.g. sand) and shaped into objects or applied as plaster. On drying, recarbonation of the material takes place and the paste returns to a hard rock state (limestone, calcium carbonate). Objects dating to the Geometric Kebaran (16.000–12.500 cal. BC) in the Levant attest to the use of lime plaster in the Epi-Palaeolithic period; the earliest evidence for its use in architecture dates to the Natufian.[14]

In the PPNB (8700–7000 cal. BC) period, the production of lime plaster developed into a veritable industry (Kingery et al. 1988). Tons of lime plaster were manufactured for the construction of house floors, large sculptures and containers, and for smaller artefacts such as beads, figurines and plastered human skulls (Kingery et al. 1988; Hauptmann and Yalcin 2002).[15] While a small-scale preparation of lime plaster is a relatively simple activity, its production in large amounts presupposes special knowledge and skills. To fire limestone for the floor of a substantial building, high temperatures must be reached and maintained over several days. Skillful handling of fire and temperature was therefore part of the technological knowhow in the PPNB period (Kingery et al. 1988, 221). Kingery et al. (1988, 240 f.) argue that the concepts and skills developed for the large-scale production of lime plaster were fundamental for the emergence of two momentous pyrotechnological innovations of the later Neolithic

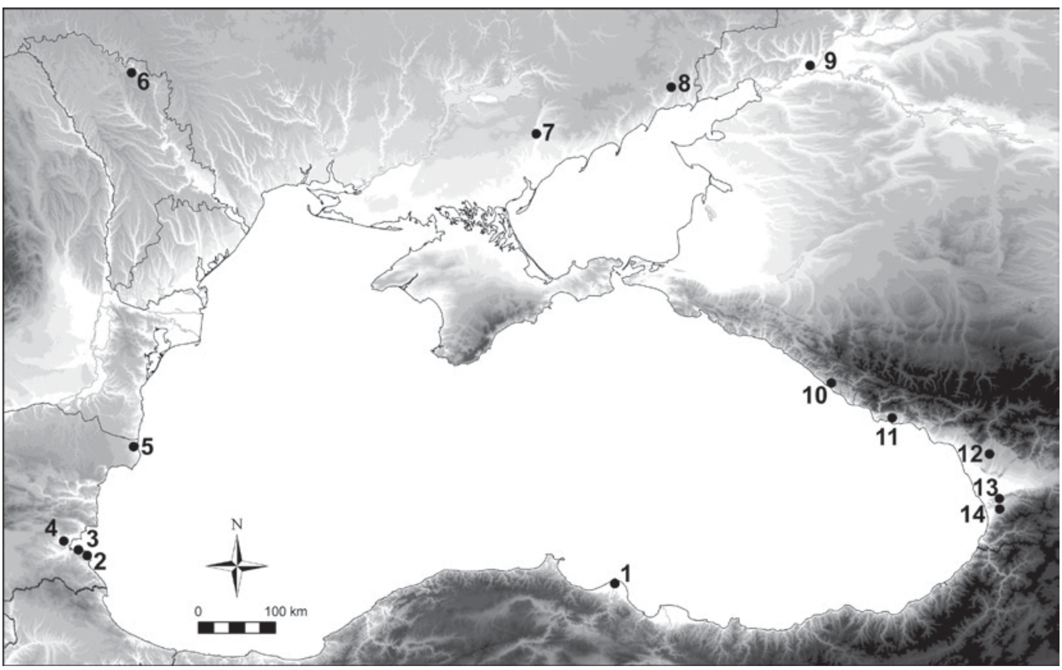

Figure 3.4 Map of the principal Neolithic sites in the Black Sea littoral mentioned in Chapter 3: (1) İkiztepe, (2) Budzhaka, (3) Akladi Cheiri, (4) Tell Burgas, (5) Durankulak Nivata, (6) Soroki, (7) Kamennaja mogila, (8) Matveev kurgan, (9) Rakushechnyj Jar, (10) Nizhnaja Shilovka, (11) Kistrik, (12) Odishi, (13) Mamati, (14) Anaseuli.

period – ceramics and metal smelting. The use of filler materials in the preparation of pastes, the use of surface coatings and burnishing, the shaping, painting and firing are among the techniques shared by lime plaster and ceramic technology, while the idea of chemically altering rocks by heat (as experienced in lime production) might have been essential for the beginning of metal extraction from ores.

The earliest secure evidence for use of metallic copper dates to the PPNB period. Copper technology began with cold-working in the ninth millennium cal. BC and has been attested at numerous sites in an arc extending from southeast Taurus to southwest Zagros (see Schoop 1995; Roberts et al. 2009).[16] The application of heat was apparently also practiced at a very early date. Annealing, for example, was apparently familiar to the copperworkers at Çayönü around 8000 cal. BC (Schoop 1995, 36 f., with references; Roberts et al. 2009, 1013). It seems that the smelting of high-grade copper ores was conceptually and technically possible during the PPNB period; however, there is no direct evidence of this technology before the sixth millennium BC.[17] Melting and casting, two techniques that require a radical conceptual change, must have been later developments. The archaeological record does not offer evidence for melting or casting of copper prior to the end of the sixth millennium BC.[18]

One of the most important pyrotechnological innovations of the Neolithic period in southwest Asia was certainly the manufacturing of ceramic containers. The earliest vessels of fired clay appeared around 7000 cal. BC. At Tell Sabi Abyad in the upper Balikh Valley, strata of the Initial Pottery Neolithic provided small quantities of thin-walled, carefully shaped and finished pottery vessels. Similar wares have been also reported from Tell Halula and Seker al-Aheimar in Syria, and Akarçay Tepe, Mezraa Teleilat and Salat Cami Yanı in southeastern Turkey (Nieuwenhuyse et al. 2010). In the upper strata of Sabi Abyad this “initial” fineware was replaced by rough and plain, plant-tempered, thick-walled ceramics. Increasing quantities of pottery sherds in these later layers, together with the general decline in quality, suggest that ceramics quickly transformed from an exceptional product to an everyday item.

Conclusions

The mid-PPNB, or the second half of the ninth millennium BC, was a crucial period in the history of technology in the Old World. The establishment of domestic plants and animals coincided with an unprecedented growth and sophistication of the entire technical system. Especially important were the developments that increased the efficiency of traditional tools and techniques of soil tillage (stone hoes), harvesting and processing of domestic plants (curved sickles, threshing sledge, large grinding stones, ovens), as well as the processing of organic materails (e.g. wood, with tools such as the polished stone axe) and inorganic materials (production of lime plaster, metalworking). With the emergence of ceramic technology around 7000 cal. BC, this socio-technical complex reached a crucial level of maturity that must have been critical for the subsequent continent-wide farming colonisation of the seventh and sixth millenniums BC.

THE SPREAD OF FARMING IN THE BLACK SEA LITTORAL

In the course of the seventh and sixth millenniums BC, farming spread from its core areas in the Fertile Crescent and central Anatolia eastwards into Central Asia and westwards into western Asia Minor and the Balkans (Whittle 1996; Bellwood 2004). The gradual expansion of farming technology is clearly demonstrated by radiocarbon chronology, while genetic studies attest to the westward movement of plants, animals and human populations (Pinhasi et al. 2000; Gkiasta et al. 2003; Haak et al. 2005). The Black Sea must have been peripheral to the process of initial farming dispersal, since the environmental conditions in large parts of the littoral are unfavourable for simple farming based on cereals and domestic ungulates. Indeed, the archaeological record suggests a late integration of the coastal regions of the Caucasus, Anatolia, the Balkans and the east European grasslands to the farming world. Yet its is important to keep in mind that the rise in sea level during the early Holocene might have obliterated the earliest traces of farming settlement on the coast (see Chapter 1).

The Coast of Anatolia

The late start of farming on the southern coast of the Black Sea, compared to the other parts of Anatolia, can be attributed to the geographic isolation of this region and its unfavourable humid climate. Farmers penetrated into the littoral most probably by crossing the lower central part of the Pontic Mountains and settling in the broad deltaic plains of Kızılırmak and Yeşilırmak. Dönmez (2006, 93) tentatively assumes a migration from the region of Ladık-Taşova or Turhal, arguing that pottery from surveys and limited excavations in this region displays some similarities with the material from the coastal sites around Bafra. Archaeological evidence for the presumed initial phases of farming, village life and pottery production, dating probably to the sixth millennium BC, is still to be discovered. So far, the earliest ceramics on the Anatolian coast of the Black Sea are represented by Assemblage AA recovered at İkiztepe II and date most probably to around the turn of the sixth to the fifth millennium BC (see Chapter 7) (Fig. 3.5). Small copper items found together with pottery of Assemblage AA suggest that the use of metals was introduced together with agriculture.

The Coast of the Balkans

The earliest villages of farmers on the Black Sea coast of the Balkans date to the last centuries of the sixth millennium BC (Todorova and Vajsov 1993). They are therefore significantly later than those in the interior of the peninsula but similar in date to the earliest sites on the Anatolian coast. The traditions of village life and the technologies of farming, pottery, textiles, lithics and copper were apparently introduced from the interior of the eastern Balkans. Features

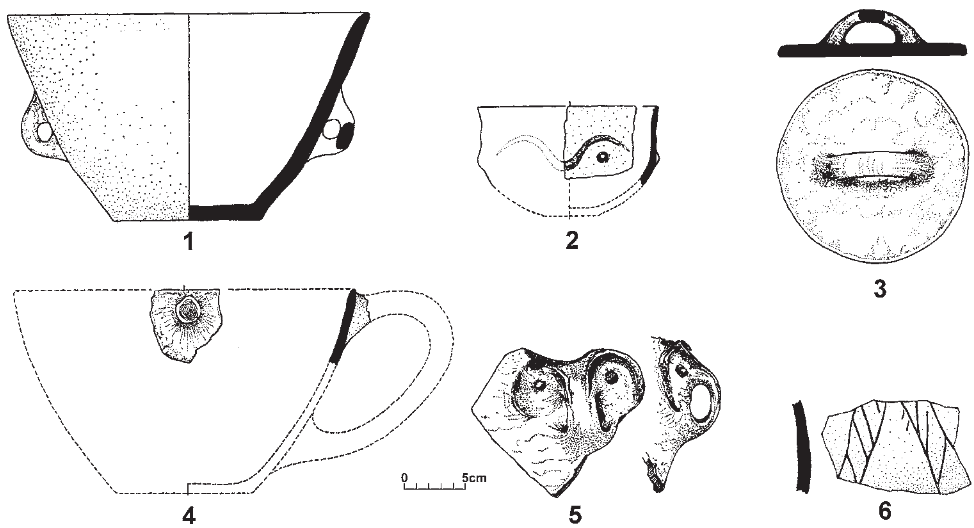

Figure 3.5 Pottery assemblage AA from İkiztepe. From Schoop (2005), after Alkım et al. (1988). Reproduced by permission of U.-D. Schoop.

of pottery at sites in the south section of the coast indicate that farmers from Thrace settled this region in the late sixth millennium BC.[19] The north part of the coast represents a different case. The burial customs, pottery, clay figurines and lithics here diverge from the interior. Some researchers assume that these peculiarities emerged by native hunter-gatherer communities adopting farming from their neighbours in the hinterland (Todorova and Vajsov 1993, 146, 224).[20]

The presence of small copper items in the earliest Neolithic assemblages throughout the Balkans suggests that the practice of cold-working native copper was introduced together with farming in the early sixth millennium BC (see Schoop 1995; Roberts et al. 2009; Borić 2009, 237).[21] The use of native copper and malachite was adopted by the inhabitants of the west Black Sea coast at the end of the sixth millennium BC. Among the earliest sites attesting to the use of metal, Grave 626 at Durankulak contained small beads of copper and malachite dating to around 5000 BC (Todorova 1999, 237).

The Northern Black Sea Littoral

During the early Holocene the lowlands of the north Black Sea were densely populated by small groups of hunter-gatherers (Dergachev and Dolukhanov 2008, 29, Fig. 4). Foraging settlements dating to the seventh millennium BC (the late Mesolithic) were numerous and widely scattered along the river valleys.[22] Faunal studies conducted in the 1960s at some of these sites have provided indications for the presence of domestic pigs and cattle, giving grounds to some researchers to postulate an "aceramic neolithic" phase in the north Black Sea region. However, recent studies of old and new faunal assemblages dating to the seventh millennium BC have failed to confirm the presence of domestic species before the introduction of pottery in the sixth millennium BC.[23]

In the second quarter of the sixth millennium BC agricultural colonists penetrated from the west and southwest into the region east of the Carpathians and established villages in the river valleys. Sites of the Criș and, in the later sixth millennium, the Linear Pottery (LBK) culture have provided polished axes; Karanovo-type antler sickles; bones of domestic pigs, cattle, sheep and goats; and characteristic pottery vessels with rounded shapes bearing the imprints of grains of emmer, barley, peas and bitter vetch (Dergachev et al.

1991; Pashkevych 2012). Beyond the eastern periphery of the Criș and LBK cultures, hunting and gathering continued for at least another 1000 years. According to available evidence, the inhabitants of the North Black Sea lowlands gradually became familiar with domestic animals and plants but did not widely adopt agriculture until the early fifth millennium BC.

An early phase of contacts between farmers and foragers, dating around the middle of the sixth millennium BC, is documented through imports of pottery and single instances of bones of domestic animals at sites in the interfluve of Dnestr and Bug and in the coastal zone of the Sea of Azov. For example, imprints of domestic cereals on pottery and a few metrically distinguishable bones of domestic cattle were recovered at Soroki III on Dnestr, but diet at this and other contemporary sites was basically based on hunting red deer and wild boar.[24] Similarly, cereal pollen and single instances of sheep and goat bones were recorded at sites near the Sea of Azov, but the inhabitants of this region relied mainly on hunting wild horse and ass.[25] On Dnepr, no domestic plants and animals have been reported from the early and middle sixth millennium BC.[26] Like early domesticated cereals, polished stone axes were introduced on Dnestr, Dnepr and on the Azov coast in the early phase through farmer-forager contacts (Wechler 2001, 227).

The second quarter of the sixth millennium was the time of adoption of pottery among the foragers. The early ceramics in the lowlands of the north Black Sea are characterized by conical vessels with pointed bottoms.[27] This ceramic tradition was not connected to the farming expansion from the west.[28] Its origin lies in the East, in an independent centre of invention in southeast Siberia, where comparable pottery of the so-called Ust-Karenga complex has been recently dated to 11.800–11.100 cal. BC (Kuzmin 2002, 41, Fig. 7) (Fig. 3.6).[29] Pointed-bottom containers spread along the southern edge of the Boreal forest both into the Black Sea grassland and into the East European Plain (the Baltic, the northern Lowlands and Western Europe) in the course of the sixth millennium BC (Dolukhanov et al. 2005, 1456 f.; Gronenborn 2011, 69).[30]

Contacts along the farming frontier continued during the second half of the sixth millennium BC. Pointed-bottom pottery was ubiquitous in this period, while domestic animals were still an exception in the grasslands and were probably obtained mainly through exchange.[31] Wider adoption of cultivation and animal breeding in the north Black Sea littoral is attested in the first half of the fifth millennium BC. At this time, the ratio of domestic to wild animal bones at some sites reached 1 to 3 (Wechler 2001, 250).[32]

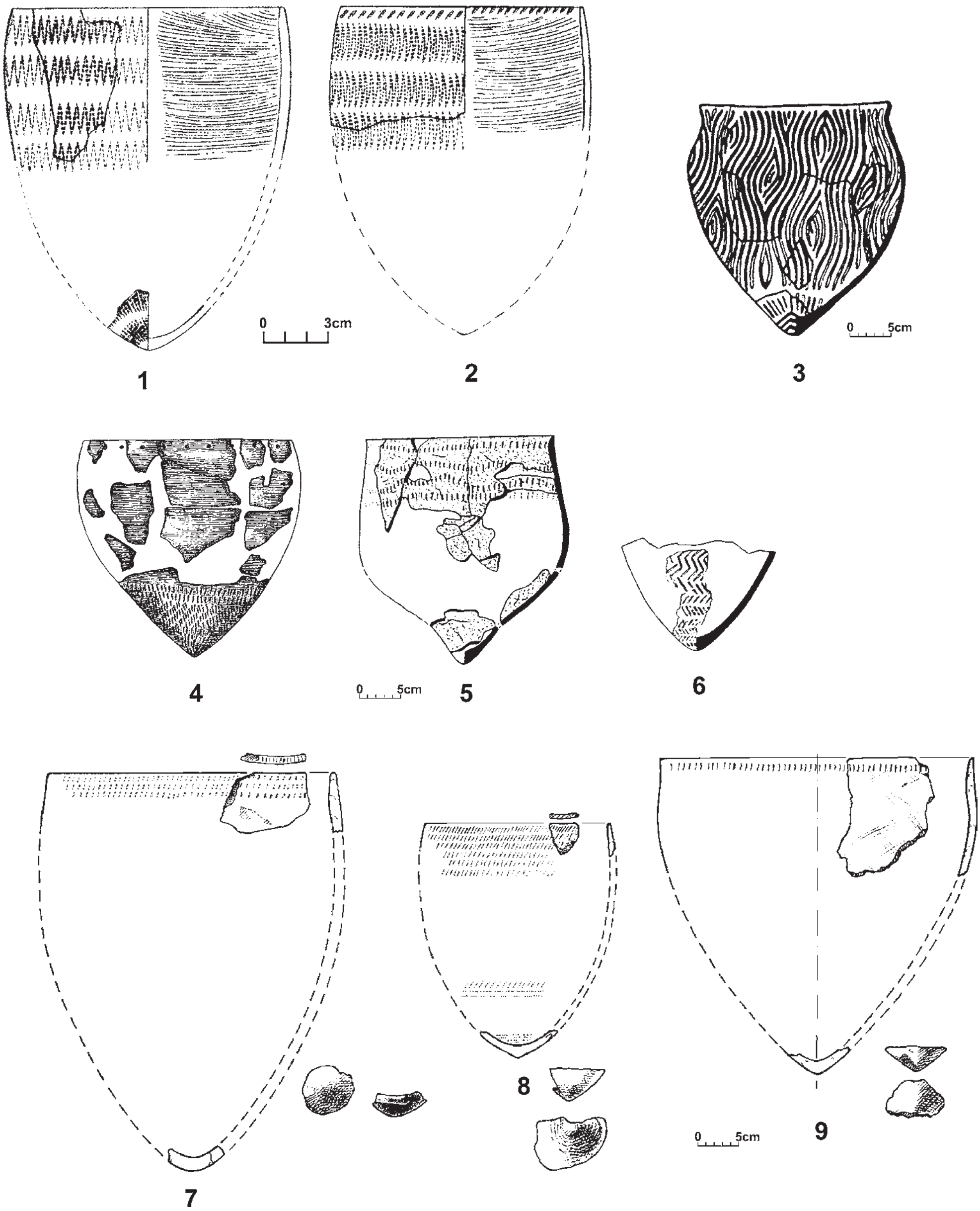

Figure 3.6 Early Neolithic pointed-bottom vessels from the site cluster at Ust Karenga in northern Transbaikal (1, 2), from sites in the north Black Sea at Sokoltsy II on South Bug (3), Zakota (4) and Grini (5) on Dnepr, Soroki II on Dnestr (6) and from Osa in the East Baltic (7–9). After Kuzmin (2002), Markevich (1974), Danilenko (1969), Telegin (1996), Titova (1990) and Dumpe et al. (2011).

In summary, during the seventh millennium the grasslands of the north Black Sea were inhabited by hunter-gatherer communities; the arrival of the first farmers on the fringes of this region in the second quarter of the sixth millennium did not bring about significant changes. The scarcity of domestic plant and animal remains in the archaeobiological record from the sixth millennium BC in the forest-steppe and steppe suggests that the new species represented exotic commodities obtained by exchange rather than reliable sources of food (see Benecke 1998; Wechler 2001, 250). Apparently, in the lowlands of the north Black Sea the dispersal of farming took place largely by local adoption and adaptation of farming technology and not by infiltration of farmers and replacement of the indigious groups. Domestic sheep, goats, cattle and pigs, and the founder crops wheat, barley and pulses were more widely adopted only in the fifth millennium BC (Wechler 2001, 250).

The Caucasian Coast

In the eastern and southern Caucasus farming was introduced around 6000 cal. BC. To the earliest farming sites in this region belong the villages of the so-called Shulaveri-Shomutepe culture, whose inhabitants constructed round mudbrick houses and practiced a sophisticated form of Near Eastern farming that included the major domestic species (cereals, pulses, pig and bovids) and the use of characteristic farming tools, such as antler hoes, sickles, mortars and saddle querns (Kushnareva 1997; Smith 2005, 253).[33] The Shulaveri-Shomutepe culture has been radiocarbon-dated to the early sixth millennium (Smith 2005, 251, with references; Welcher 2001, 198 f., with references).

Changes accompanying the introduction of farming were less pronounced in the Black Sea littoral of the Caucasus. A group of coastal and inland sites such as Apiancha, Paluri, Khorshi, Anaseuli I, Khutsubani, Kobuleti and Darkveti has provided characteristic lithic material including polished stone axes (Bzhanija 1996, 75, Fig. 22). The chipped stone assemblages from these sites included a smaller microlithic component and a higher proportion of blades in comparison to the local Mesolithic industry. Unfortunately, the lithic finds were not associated with pottery, animal bones or charred seeds. Only one "aceramic"site, Layer IV of the Darkveti rock shelter in the interior of western Georgia, yielded a faunal assemblage containing sheep bones (Kiguradze and Menabde 2004, 350). Unfortunately, no radiocarbon dates are available for this important assemblage. A second "ceramic" group of sites such as Kistrik, Odishi, Mamati, Anaseuli II and Nizhnaja Shilovka provided both sherds of crude handmade pottery and farming tools, for instance flint sickle inserts, stone hoes, mortars and grinding stones (Munchaev 1975, 70, Kiguradze and Menabde 2004, 351) (Fig. 3.7).

The correlation of the "aceramic" and "ceramic" assemblages described previously with material from other regions in the southern Caucasus and Eastern Anatolia is impeded by the absence of clear comparisons and radiocarbon dates. It has been generally assumed that the assemblages with pottery are later. Chataigner (1995, 104, 218) pointed at similarities between the pottery of the Black Sea littoral of the Caucasus and that of east Anatolian sites such as Tepecik and Kurucutepe, while Munchaev (1975, 79) and later Wechler (2001, 197–199) have compared it with the ceramics of the Shulaveri-Shomutepe culture. If correct, these observations may date the assemblages with

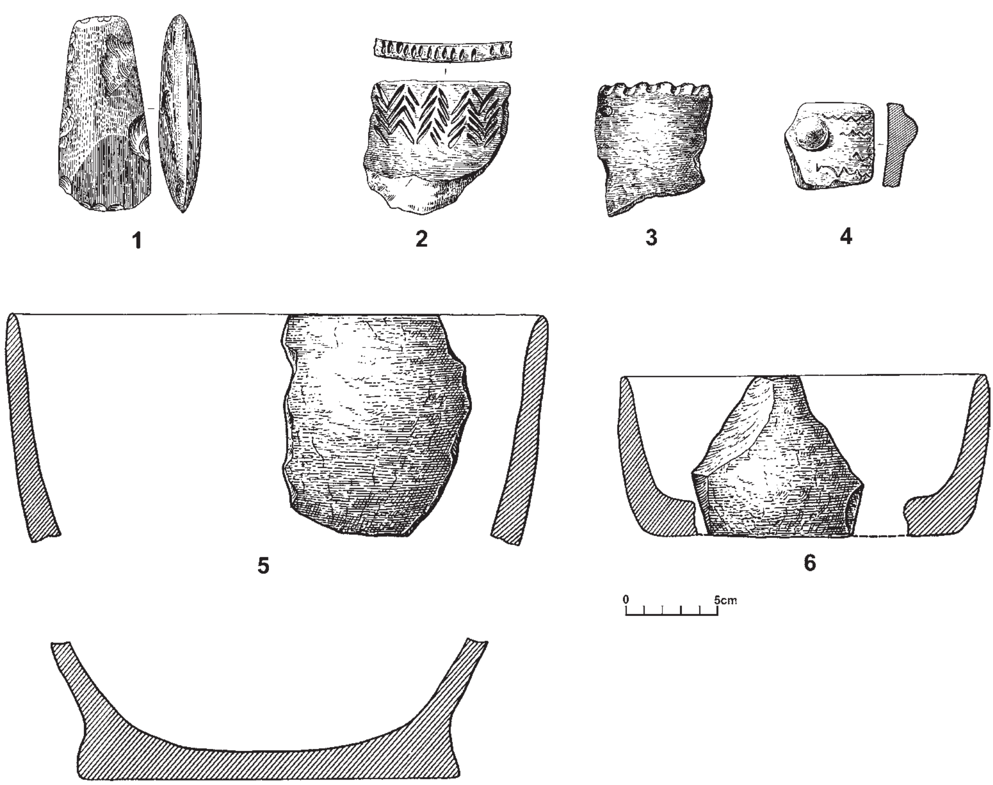

Figure 3.7 Artefacts from the Neolithic sites Kistrik (1 and 6), Anaseuli II (2–4) and Nizhnaja Shilovka (5 and 7). After Bzhanija (1996).

early pottery in the coastal Caucasus to the sixth millennium BC. The chronology of the aceramic sites remains obscure, and they may either belong to the sixth or to the seventh millennium BC.

OUTLOOK: THE AGE OF COPPER

The fifth millennium BC witnessed the apogee of the technological and social traditions that came into being with the establishment of the first farming villages around the Black Sea in the centuries before. The hallmark of this period was the development of advanced metallurgy of copper, including the subsurface extraction and smelting of copper ores and the melting and casting of large metal artefacts.[34]

Manufacturing and circulation of valuables, such as decorations and tools of exotic materials, in this period attained unprecedented scale and sophistication. Among the fifth-millennium sites in the Black Sea littoral, the cemeteries on the northwest littoral of the Black Sea have provided the largest concentrations and the most complex expressions of material wealth. A maritime trading route joining the resource-poor north with the resource-rich south of the west littoral, as has been argued elsewhere, offers a plausible explanation for the anomalous prosperity on the Black Sea coast of the Balkans in the fifth millennium BC (Ivanova 2012). The web of contacts reached far beyond the sedentary farming area, as indicated by grave finds scattered in the dry lowlands between the Lower Danube and the foothills of the Caucasus.[35] Rassamakin (2002a, 63) argues for the establishment of a "system of prestigeous exchange" spanning the grasslands of the northern Black Sea and attributes its origin to the sophisticated social practices and habits of the farming communities of the Balkans and the eastern Carpathians.

In contrast, the south and southeast coastlands of the Black Sea have provided little evidence for long-distance contacts. However, a hoard of gold jewelry said to originate from the vicinity of Trabzon (Rudolph 1978) seems to support the idea of a Copper Age Black Sea *koine*. The second group of artefacts from this hoard, which appears consistent in its contents, includes a number of artefacts with obvious parallels in the late-fifth-millennium jewelry of the western Black Sea coast, for example convex gold-sheet buttons, beads, a crescent pectoral decorated with repoussé dots, snail and carnelian beads (for comparisons see Todorova and Vajsov 2001). Not just the discrete objects but also the characteristic combinations of items and raw materials suggest a connection with the coast of the Balkans.

Representing possibly the best-studied episode in the prehistory of the Black Sea, the fifth millennium BC will not be discussed in further detail in the present study. The major focus of Chapters 4 to 7 is the fourth millennium, a period in which the Black Sea attained a new role in global history.

4

The Valley of the Lower Kuban

INTRODUCTION

Archaeological Fieldwork

The excavations of Veselovskij in the last decade of the nineteenth century revealed the first lavishly furnished prehistoric graves at Maikop and Tsarskaja in the foothills of the north Caucasus (see Tikhonov 2009).[1] Finds in the steppe of Kuban were less spectacular: for example, a related but modestly furnished grave containing four ochre-coloured skeletons in a crouched position, accompanied by several large copper objects, was excavated by Veselovskij in 1899 in a kurgan near Vozdvizhenskaja (Veselovskij 1902, 47). Furthermore, a hoard of objects with comparisons at Maikop came to light north of the lower Kuban near Staromyshastovskaja in 1897.[2] The hoard was deposited in a small silver jar and included a silver figurine of an antelope with a vertical opening in the body; a lionhead-shaped gold pendant; a 60 cm long and 0.5 cm wide strip of silver foil similar to the gold headbands of Maikop and some 3.000 beads, rings and other small items of gold, carnelian, lapis lazuli and faience (Veselovskij 1900b, 64 f.; Piotrovskij 1998, 246; Korenevskij 2004, 48).

In contrast to the regions north and northwest of the Black Sea, no major constructions with accompanying salvage archaeological projects took place on the lower Kuban after the early decades of the twentieth century and the Azov-Kuban steppe remained an unexplored terrain until the late 1970s. In 1977–1979, an expedition directed by Safronov worked north of the lower Kuban.[3] Active fieldwork continued during the 1980s, mainly as rescue excavations during the construction of the Zakubanskaja irrigation system. Several expeditions from Moscow, St. Petersburg and local institutions investigated numerous kurgans and habitation sites in the steppe area, around the Krasnodar reservoir and south of the lower Kuban.[4] During the 1990s and early 2000s, in the course of an economical and political crisis, fieldwork continued on a reduced scale near the Krasnodar reservoir (Rezepkin 2004b; Rezepkin and Poplevko 2006; Rezepkin and Lyonnet 2007). Several sites were also excavated in the coastal area and south of Kuban. For example, Kurgan 4 at Natukhaevskaja I was explored by the Novorosijsk Museum of History in 2004 (Shishlov and Fedorenko 2006), while the Caucasus expedition of the State Museum for Near Eastern Art and the Archaeological Institute at Moscow excavated Kurgan 1 at Tenginskaja, Kurgan 2 at Uashkhitu I, and recently a settlement at Uljap (Erlikh et al. 2006, Brileva and Erlikh 2011).[5] A significant achievement in the last decades was the accumulation of settlement data (Lovpache and Ditler 1988; Dneprovskij and Jakovlev 1989; Rezepkin and Lyonnet 2007; Brileva and Erlikh 2011) (Fig. 4.1).

Synopses

The fundamentals of north Caucasian prehistory were laid by an influential article about the chronology and cultural attribution of the earliest graves of the Kuban region published by Iessen in 1950 (Иессен, А. А., К хронологии «больших кубанских курганов», *Советская археология* 12, 1950). The article was based on less than thirty grave complexes, grouped together by Iessen on typological grounds.[6] It offered a systematic description of the grave contexts, an assessment of their stratigraphic relations to other grave types (Catacomb and North Caucasian), as well as a typology and comparisons for the grave finds. The first monographic book about the Maikop culture was published by Munchaev in 1975. Munchaev's review encompassed the whole area to the north of the main Caucasus range from the Black Sea to the Caspian. He added material from recently excavated sites at Ust Dzheguta, Nalchik, Chegem and Bamut to the data summarized by Iessen.

In the 1990s, new evidence from field research and the first radiocarbon dates opened an avenue for a reassessment of the Maikop culture. Korenevskij published in 2004 an updated comprehensive study of the accumulated archaeological material and a discussion of its internal chronology and cultural affiliation (Korenevskij 2004). Using combined evidence of graves and settlements, Korenevskij distinguished several local pottery groups. One of these groups was distributed over the whole area of the Caucasus piedmont and characterized by round-bottomed jars with short necks bearing "potter's marks". Korenevskij regards this pottery group as the earliest. At a later stage, the pottery traditions in the western and eastern parts of the region separated. In the area of Kuban the round-bottomed tradition continued, now without potter's marks, while flat-bottomed shapes appeared in the central part of the Caucasus piedmont. The latter seem unrelated to the round-bottomed ceramics and might document an influence from the south Caucasus (Korenevskij 2004, 49–63).

An important issue in the core of the controversy about the Maikop assemblage is the question of its origin. The quest for the Near Eastern progenitor of the north Caucasian material started

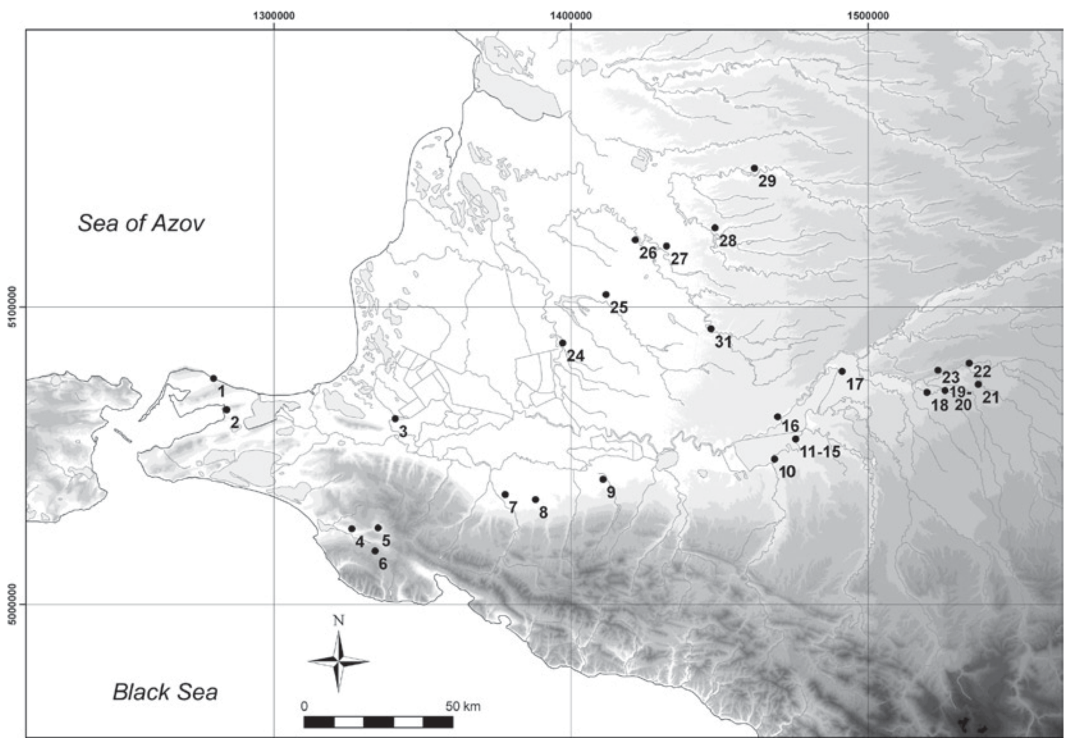

Figure 4.1 Principal sites in the valley of the Lower Kuban mentioned in Chapter 4: (1) Fontan (Kuchugury), (2) Sennaja, (3) Temrjuk (Korzhevskij), (4) Rassvet, (5) Natukhaevskaja, (6) Raevskaja, (7) Jastrebovskij, (8) Bugundyr, (9) Obshtestvennyj, (10) Psekup, (11) Chishkho, (12) Gorodskoj, (13) Taujkhabl, (14) Pkhagugape, (15) Pshikujkhabl, (16) Starokorsunskaja, (17) Krasnogvardejskoe, (18) Uljap, (19) Chernyshev II, (20) Sereginskoe, (21) Uashkhitu, (22) Vozdvizhenskaja, (23) Tenginskaja, (24) Staronizhnesteblievskaja, (25) Olenij, (26) Dneprovskaja, (27) Timashevsk, (28) Novokorsunskaja, (29) Baturinskaja, (30) Staromyshastovskaja, (31) Psyb.

soon after the discovery of the Kurgan of Maikop and concentrated initially on comparisons of single metal objects for dating purposes (for a summary see Andreeva 1977, 39–43). In the 1970s, similarities between the pottery traditions of Maikop and the early/mid-Uruk period in Greater Mesopotamia led Andreeva (1977, 55 f.) to postulate the synchronicity of these two periods. Today, many archaeologists see Maikop in the context of the "Uruk expansion", a model in Near Eastern archaeology that easily fits into the migration paradigm of Russian-language research. The proponents of this hypothesis consider Maikop as either a direct offshoot of a south Mesopotamian expansion into the resource-rich mountainous periphery of the alluvium (Sherratt 1997a, 464; Sherratt 2003b, 240; recently Munchaev 2007) or as a dependent cultural phenomenon transforming under persistent late Uruk "impulses" (Rezepkin 2004a). However, as Munchaev (1975, 376 f.) admits, the exact mechanisms of contact remain elusive and the accepted hypothesis of migration is not supported by actual evidence. I will return to these issues at the end of the present chapter.

Chronology

Early attempts to date the lavish graves at Maikop and Tsarskaja relied on stylistic comparisons to the art of the Mediterranean and the Near East. Tallgren related in 1911 the silver vessels of Maikop to "Priam's Treasure" at Troy II and proposed a date around 2000 BC (Tallgren 1911). Schmidt associated in 1929 some finds of his "frühkubanische Gruppe" with the newly investigated Early Dynastic royal cemetery of Ur (e.g. the spearheads and the gold beads), adding further grounds for a third-millennium date (Schmidt 1929, 19 f.). Iessen (1950) agreed with the earlier comparisons to the treasures of Troy II and the Royal Cemetery at Ur, and saw similarities "in the overall appearance of the grave complexes" between Maikop and some recently recovered graves at Alacahöyük in central Anatolia (though he admitted that direct comparisons were absent).[7] In her research on the contacts of the north Caucasus with the Near Eastern world, Andreeva (1977) compared the pottery technology and morphology of these two regions and was able to identify certain similarities between Maikop and the Amuq F assemblage in the plain of Antakya and Gawra XII on the Upper Tigris. She postulated a "genetic link" between the pottery material of early Maikop and northern Mesopotamia and argued for a synchronicity of Maikop and the Uruk period in Mesopotamia.

Although such general comparisons over vast distances have heuristic value, they are too speculative to anchor the floating north Caucasian chronology. For now, the relative dating of the north Caucasian material is possible only through stratified imports in the neighbouring steppe region. Imports of Maikop pottery were found at the settlement at Razdorskoe I on the lower Don.[8] The imported vessels belonged only to Layers 6 and 7 and were associated with "Konstantinovskoe-type" pottery (with cord decoration). A layer with Repin pottery (or so-called early Jamnaja pottery, represented e.g. in the middle level of Mikhajlovka on the lower Dnepr) covered the stratum with Caucasian imports (Kijashko 1987, 77, 79). Stratigraphic data from some kurgans also support the dating of Maikop before the beginning of Jamnaja (before 3000 BC). The graves of the Novotitorovskaja culture north of Kuban and the Petropavlovskaja culture south of Kuban, which can be synchronized with the developed and late Jamnaja periods through characteristic "hammer-head pins" and vessels, are always stratigraphically later than those of the Maikop period (Gej 1991, 66 f.).

Since the publication of the first radiocarbon dates from the site of Galjugaj by Korenevskij (1993a), a significant corpus of radiocarbon dates from Maikop sites has accumulated.[9] The majority of the datings are single measurements on samples of human and animal bones from graves. Recently, Korenevskij (2008a, Table 2) has published a comprehensive list of ^{14}C dates from the Maikop period. He recognizes a very early period (4000–3600 BC) which is supported with only three datings – from Brut 3/3, Klady 29/1 and Kudakhurt 1/1. All other values listed by Korenevskij range between 3600 and 2900 BC. Among the dates are also three measurements from sites in the Kuban-Azov steppe, all of them falling into the fourth millennium BC.[10] The radiocarbon dates leave little doubt that the Maikop culture belongs to the middle and late fourth millennium. Two significant chronological questions, however, are left unresolved. On the one hand, neither the imports at sites in the steppe nor the ^{14}C dates allow us to securely date the beginning of the Maikop period. Moreover, since multi-period habitation sites are absent in the north Caucasus, the differentiation between early and late materials inside the large body of Maikop finds remains a matter of conjecture. Unfortunately, the available ^{14}C dates are not sensitive and exact enough to elucidate the internal chronology of the Maikop period.

SHIFTING HOUSEHOLDS AND STABLE CEMETERIES

Habitation Sites

The evidence for settlements in the Kuban and Azov steppes is very scarce.[11] Erosion of the generally thin occupation layers might account for the difficulty in locating habitation sites dating to the Maikop period. Moreover, as suggested by Korenevskij (2008a, 98), many sites might have been buried under thick layers of colluvium and thus are difficult to locate during surface surveys. Most settlements were discovered during excavations of kurgans, where a later barrow protected the prehistoric habitation deposit from erosion and damage (see e.g. Dneprovskij and Jakovlev 1989, 28; Brileva and Erlikh 2011). Furthermore, a series of sites were uncovered by the annual water level fluctuations in the Krasnodar reservoir (see Lovpache and Ditler 1988; Rezepkin and Lyonnet 2007). The available evidence suggests that the settlements were situated near river banks without consideration of defensive advantages. Chishkho, Pshikujkhabl, Gorodskoj and Pkhagugape lie 1.5–2 km from each other along the present bank of Krasnodar reservoir (Rezepkin and Lyonnet 2007). Some 7 km further westward, near the mouth of the river Psekup, is situated another site of the same period (Lovpache and Ditler 1988). Such clustering is not limited to the area of Kuban. An identical situation was observed in the steppe of Terek in the central Caucasus, where a cluster of six extensive habitation sites was identified at Galjugaj (Korenevskij 1993a, 2004, 73). Occupation at all investigated settlements was comparatively short and formed a thin archaeological layer. Data about the size of the villages are very limited. At Sereginskoe, the surface finds extended over an area of c. 5 ha but undisturbed strata with depths of c. 0.4 m were found only under an Iron Age kurgan (Dneprovskij and Jakovlev 1989; Dneprovskij and Korenevskij 1996, 4 f.).

The features excavated at the habitation sites comprise burned wattle-and-daub structures and pits. Dneprovskij investigated a group of such structures at Sereginskoe (Dneprovskij 1991; Dneprovskij and Jakovlev 1989). Structure 1 was round and had a diameter of 7 m, wattle-and-daub walls and a beaten clay floor.

In its interior were uncovered two hearths and two ovens. A second, roughly rectangular structure with a length of 4.5 m and a hearth in its interior was situated several metres from the first one. Structures 1 and 2 were probably dwellings. Two additional smaller wattle-and-daub features lay immediately north of them. They had neither hearths nor other furnishings and were used, according to the excavators, as storage rooms. The village probably consisted of several such complexes of dwellings and storage facilities. Numerous round structures similar in size and plan to Structure 1 at Sereginskoe were investigated at sites on the southern shore of Krasnodar reservoir. At Chishkho, the excavators uncovered remains of two round wattle-and-daub houses situated 150 m apart. Between the two structures lay pieces of daub, possibly from further dwellings (Rezepkin 2004b; Rezepkin and Lyonnet 2007).[12] The Gorodskoj settlement, which was investigated on a larger scale, consisted of single houses and groups of several round structures spread over an extensive area and in considerable distance from each other (Rezepkin and Lyonnet 2007, Fig. 1). Their distribution does not display any specific planning, and there is no conclusive evidence that all uncovered features were contemporary. A similar distribution of structures was observed at Pshikujkhabl (Rezepkin and Lyonnet 2007, Fig. 12). At both Gorodskoj and Pshikujkhabl, some fifteen to twenty structures were detected over an area of investigation of c. 2 ha, while the whole area of habitation might have been considerably larger (Fig. 4.2).

Wattle-and-daub was the main building construction of the Maikop period. Riond (2007) has investigated the remains of burned wattle-and-daub houses and has identified the building materials and techniques at Chishkho on the bank of Krasnodar reservoir. According to Riond, the wall plaster was prepared from levigated clay mixed with straw and the wattle was constructed with plant material from the riverbanks, for example reed and willow wood and twigs. Rezepkin (2004b, 422) reports that pieces of daub with imprints of 1.5–4 cm thick reeds and twigs were found at Chishkho. There is no evidence for the height of the walls and the roof construction of the buildings. The roofs of the circular structures were possibly cone shaped, thatched, and supported by the walls. The buildings at Chishkho must have been constructed without large timber posts, since postholes are absent altogether (see Rezepkin 2004b, 422). This feature was also observed at Sereginskoe, south of

Kuban, and at Galjugaj, in the central Caucasus (Dneprovskij 1991; Korenevskij 1995). Timber and stone were utilized in the construction of tomb chambers but not in domestic structures. In contrast to the architecture in southwest Asia, mudbrick and pisé were not used for construction north of the main range of the Caucasus.

The inhabitants of the north Caucasus lived in aboveground dwellings. Completely absent are remains of monumental, robust, complex, large or two-story structures. All investigated buildings have the same, very simple ground plan – they are freestanding circular structures with a diameter of 5–7 m and only one room (Fig. 4.3). Round buildings have several peculiarities in terms of construction

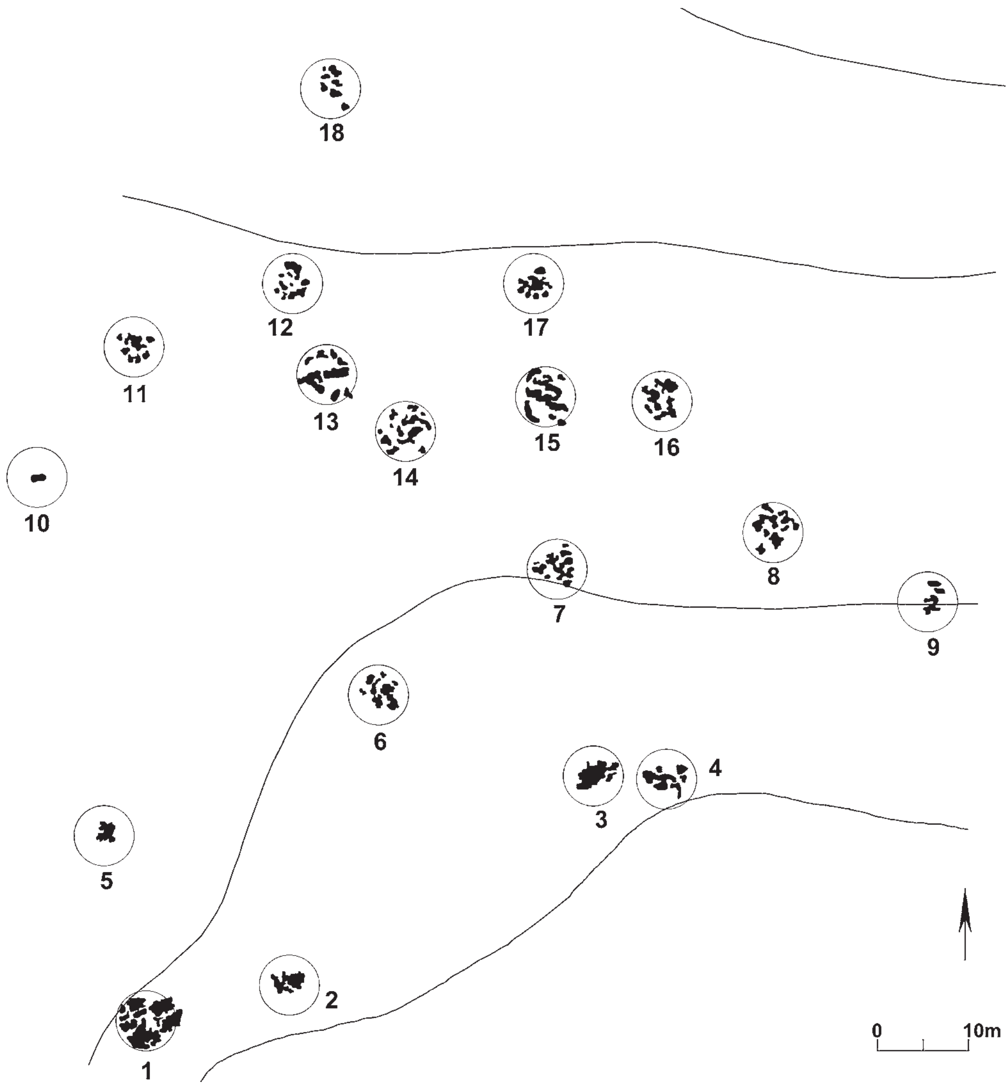

Figure 4.2 Pshikujkhabl, plan of the habitation site. After Rezepkin and Lyonnet (2007, Fig. 12).

costs, durability and use. They are less demanding in building materials in comparison to structures with rectangular plans, since circular forms can be constructed from unprepared, irregular and flexible materials (McGuire and Schiffer 1983, 284). The low cost of construction, however, is counterweighed by higher maintenance costs and shorter use life. Moreover, in comparison to rectangular buildings, round buildings are less suitable for internal partitioning into storage, cooking, and sleeping areas. Adding on to the building is also difficult, though the problem of adding rooms arises only for dwellings that are occupied for an extended period of time.

A peculiar feature of the houses at Gorodskoj, Pshikujkhabl and Chishkho was a shallow pit with a diameter of about 1 m, sometimes plastered with clay and filled with charcoal and stones, situated in the centre of the round room (Rezepkin and Lyonnet 2007) (Fig. 4.3). The pits remained for the lifetime of the houses. After the buildings were abandoned the pits were filled with broken pottery vessels and covered with the debris of the collapsed walls and roof. These pits probably represent a customary cooking facility (a "pit hearth").[13] In rare cases, the hearth pit was accompanied by a second larger pit with a diameter and a depth of more than 2 m, which probably

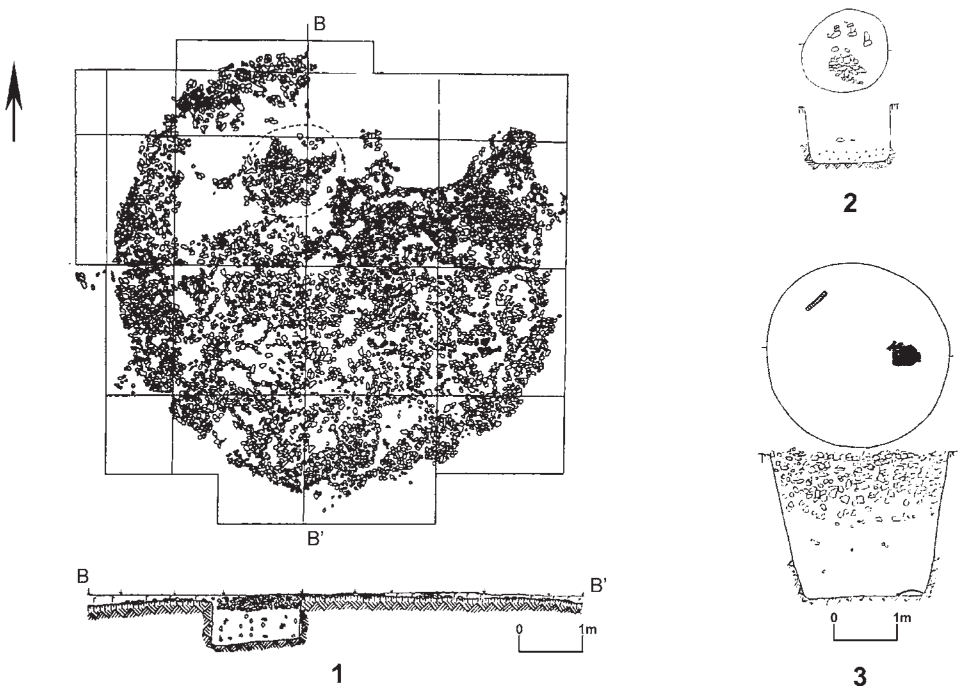

Figure 4.3 Plan of House 7 (1), hearth pit (2) and storage pit (3) from House 5 at Gorodskoj. After Rezepkin and Lyonnet (2007, Figs. 2 and 10).

served for storage (e.g. in Houses 5 and 6 at Gorodskoj, Rezepkin and Lyonnet 2007) (Fig. 4.3).

Many of the excavated houses were destroyed by conflagration, though apparently not by sudden unexpected fire, since the majority of the finds do not represent original household inventories but secondary refuse consisting of broken objects, most of which were found in the "hearth pits" (pottery fragments, bones, broken tools). The hearths, pithoi, sherds of cooking vessels, and saddle querns in the buildings suggest that food preparation was performed inside the houses. The inhabitants stored staple foods in large ceramic vessels inside and possibly immediately in front of the buildings.[14] There are some indications for additional facilities like large storage pits and separate storage buildings near the main house (see for example Structures 3 and 4 at Sereginskoe and Houses 5 and 6 at Gorodskoj, Dneprovskij 1991, 4f., Rezepkin and Lyonnet 2007, 6, Fig. 2, 3).[15] Although specialized workshops or work areas have not been identified, pottery kilns were reported for Pkhagugape and Psekup (Poplevko 2008b, 222).

In summary, careful planning and economical use of space were not characteristic for the villages in the valley of the lower Kuban. Specialized structures, like communal buildings or workshops, were apparently absent, and simple, light, one-roomed structures without significant traces of repair prevail at the investigated sites. The complete absence of multi-layer settlements or even of traces of rebuilding suggests short periods of habitation. This situation is usually interpreted as evidence for a "semi-sedentary lifestyle", that is an economy based on simple plant cultivation under conditions of high soil fertility, contemporary loose habitation over an extended area for several decades, and relocation to a new site following soil exhaustion (Korenevskij 1993b, 22 f.; 2004, 74). However, this model contradicts the development of large cemeteries and the considerable investment in massive mortuary monuments that were characteristic of the period (see the section titled "Cemeteries" in this chapter). The construction and repeated use and maintenance of numbers of large earth barrows suggest relatedness to a particular place and territorial conscience.

A more flexible model in which not the whole communities but rather the households are mobile can resolve the contradiction. At first sight, the idea of household mobility may seem strange to the archaeologist. However, this peculiar behaviour has been observed by ethnographers and suggested for several archaeological contexts. According to McGuire and Schiffer (1983, 286 f.), the households of the Kekchi Maya in Belize move frequently within the village and between neighbouring settlements and, for this reason, invest little effort in building expensive and substantial dwellings. However, the villages themselves are not mobile. The authors give several examples for a similar pattern of household mobility from the archaeological record. For instance, the Sedentary period Hohokam constructed permanent monumental structures like platform mounds and canals and occupied their settlement sites for centuries, but their domestic architecture included only insubstantial pit houses.

Rather than occupying the whole area of their habitation sites simultaneously, the north Caucasian communities might have also consisted of only a few households dwelling in discrete groups of buildings, which "drifted" over the settlement area and between sites in a settlement cluster with changes of generations, household size and composition. Moreover, although the light and unsubstantial character of the architecture in the villages of the Maikop period is usually interpreted as an indication for limited settlement permanence, the short use life of the dwellings does not necessarily correlate with a mobile lifestyle. Household mobility, as proposed previously, as well as limitations of raw materials or technology may account for the choice of less substantial building methods. In such cases, the disadvantage of relatively small and short-lived dwellings is compensated by constructing several separate structures for different purposes (McGuire and Schiffer 1983, 287).

Cemeteries

The most common form of burial in the Azov-Kuban lowlands was the inhumation in a simple rectangular pit (Fig. 4.4).[16] The floor of the grave pit was sometimes lined with mats.[17] More elaborate graves included a pebble-laid floor and a wooden frame, or a stone-built frame.[18] Tomb chambers of timber planks or stone slabs such as these investigated in the central Caucasus and "dolmens" (tombs of large stone slabs with pitched roofs), characteristic of the western piedmont, are absent on the lower Kuban.[19] A contracted posture on the right side with hands in front of the face strongly predominates among the skeletal positions (Fig. 4.5).[20] The use of red pigment was very common and was observed, for example, at the cemeteries of

Olenij and Obshtestvennoe (Gej 2008, 184; Sorokina and Orlovskaja 1993, 234). Several objects, most frequently pottery vessels, were placed near the body of the deceased. As a rule, the pits were not filled with earth but were closed with timber planks or logs to form tomb chambers like those at Olenij I 1/16, Tenginskaja 1/6 and Chernyshev II (Gej 2008, 181, Fig. 5; Korenevskij 2008b, 11; Bianki and Dneprovskij

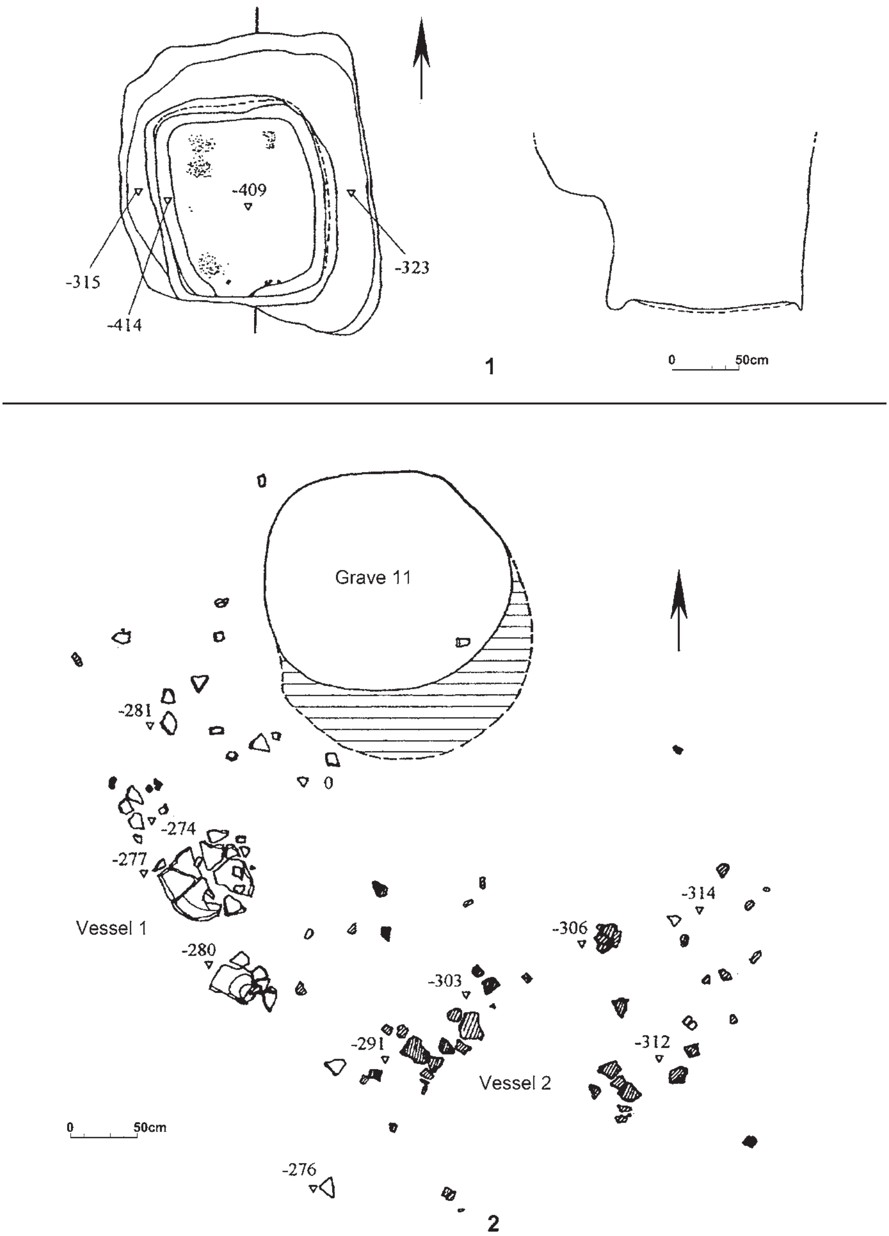

Figure 4.4 Olenij 1/11, plan and section of the grave pit (1) and surroundings of the grave (2). After Gej (2008, Fig. 6).

1988, Fig. 6). The area over and around the grave was sometimes covered with reed mats and a pile of stones was often assembled over the grave.[21] Funeral meals around the grave are well documented with hearths, pit ovens, and large amounts of broken vessels and clay cone fragments (Fig. 4.4).[22] Very large vessels have been reported from Kurgan 1 at Obshtestvennoe II (Sorokina and Orlovskaja 1993), while several large hearths and crushed coarse pots, including at least one very large pottery "cauldron", were uncovered around the grave in Kurgan 1 at Chernyshev II (Bianki and Dneprovskij 1988, 74).

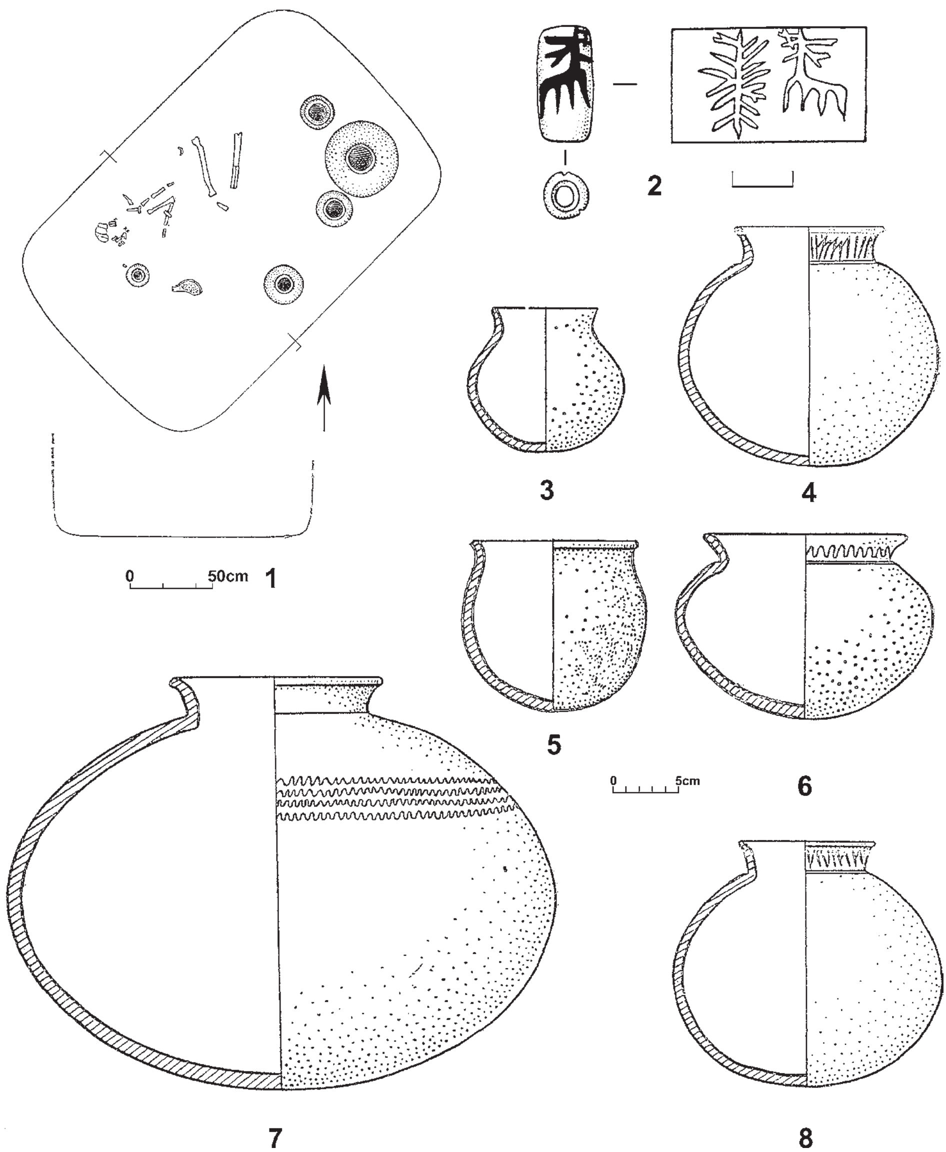

Figure 4.5 Grave 4 at Krasnogvardejskoe. (2) Carnelian, (3–8) pottery. After Nekhaev (1986).

Moreover, two of the crushed vessels associated with Grave 1/11 at Olenij I were very large jars with globular bodies, low narrow necks and heights of 70–80 cm (see Fig. 4.7 later). Such sizable vessels provide, quite obviously, indirect evidence for large gatherings accompanied by food distribution, since very large pots are unsuitable for everyday household food preparation (see also Clarke 2001, 159). The scale of the feasting events and the number of participants are, however, difficult to assess.

At the end of the burial ceremony, an earth kurgan and a rubble stone revetment were erected with the grave in the centre (Fig. 4.6).[23] Among the largest, the stone belt of Jastrebovskij was 4 m wide and 27 m in diameter (Gej 2008, 179), and the kurgans near Rassvet had rubble circles with widths of 1–2 m and diameters of 20–25 m (Munchaev 1975, 263–266). The original height of the barrows is often difficult to reconstruct and can range from one to several metres.[24] The mound at Jastrebovskij was constructed in two stages: the initial kurgan was 5.6 m in diameter and 0.40 m high; after a subsequent enlargement, its diameter reached 28 m and it rose to a height of 2.30 m, while its lower slopes were now supported by the previously mentioned 4 m wide stone belt.[25] Some kurgans were re-used and most contained between one and seven graves. There are also cases of re-use of tomb chambers, for example in Kurgan 1 at Obshtestvennoe II (Sorokina and Orlovskaja 1993). Information about the sizes and plans of the cemeteries is limited, since often only a few kurgans were excavated and the sites usually contained mounds of several periods between the fourth millennium BC and the Middle Ages. Typical topographic positions of kurgan groups are watersheds, high banks and elongated hills.[26]

Objects placed in the grave include pottery (jars, cups and bowls), personal decorations and tools of varying quality and value. "Regular" graves, for example those at the cemeteries of Natukhaevskaja 3, Uashkhitu 1, Obshtestvennoe 1, Timashevsk and Novokorsunskaja, contained one or several clay vessels, red pigment, flint flakes, blades and retouched asymmetrical arrow heads, small bronze implements, a single metal dagger or axe, beads of deer teeth, antler, stone, or single gold rings (Shishlov et al. 2009; Korenevskij and Dneprovskij 2003; Sorokina and Orlovskaja 1993; Kaminskij 1993; Rezepkin 2000, 74). Some remarkably sumptuous graves, however, were furnished with very costly, finely manufactured, exotic or excessively numerous objects placed in an elaborate tomb chamber. The hoard of Staromyshastovskaja and a damaged grave at Uljap (Grave 5) southeast of Krasnodar reservoir show that the practice of sumptuous funerals was not unfamiliar to the inhabitants of the lower Kuban. The large pit of Grave 5 at Uljap had a preserved size of 2.7 × 3.2 m and walls supported by a wooden frame. There were traces of ochre on the floor. Sadly, the grave at Uljap was opened and emptied in antiquity but it still contained six gold and three carnelian beads, faience beads and fragments of two silver objects. The seventeen microlithic segments found in this grave have

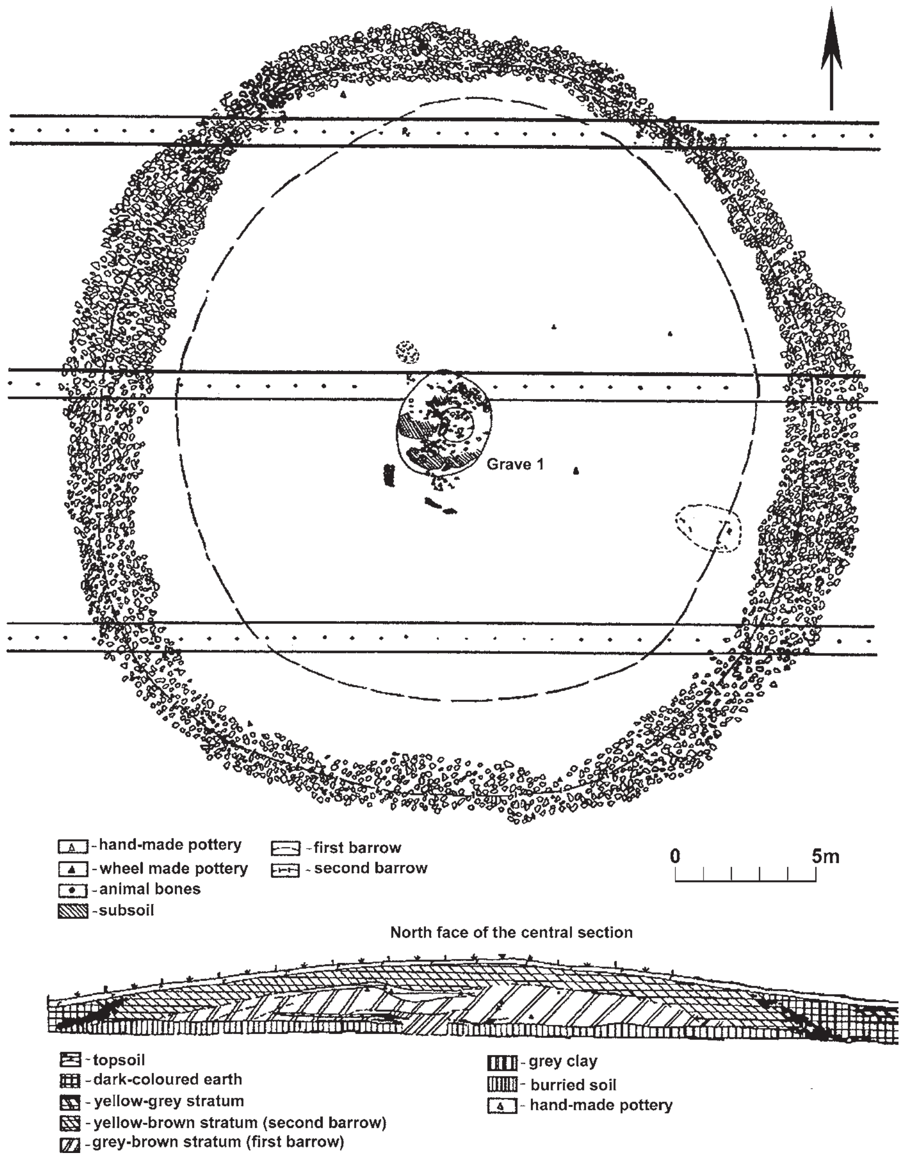

Figure 4.6 Kurgan 1 at Jastrebovskij. After Gej (2008, Fig. 2).

an exact parallel in the grave at Maikop (Eskina 1996, Fig. 1, 11–27; cf. Stoljar 1996, 62).

The great majority of Maikop-period graves had been opened at some time in the past and the most valuable items were removed. Therefore, finds of undamaged lavish graves are extremely rare in all parts of the north Caucasus.[27] Even though all unplundered exceptional kurgans were situated at a considerable distance from the lower Kuban, it seems relevant to describe here three of the most eminent sites – the tombs at Nalchik, Maikop and Klady.

At Nalchik in Kabardino-Balkaria two adult individuals were buried in a large stone cist built of narrow long slabs. The floor of the cist was lined with pebbles and its walls were coloured in red. The deceased were covered with red pigment and accompanied by numerous items of decoration. Two gold rings and two large gold beads adorned the head, 263 tiny gold beads were placed on the chest and gold strips lay in the abdominal area and thighs of the smaller skeleton. Copper weapons and tools, including two daggers, two awls, two shafthole axes and a chisel, a copper bowl, a pottery vessel, an obsidian arrowhead, flint tools, and the largest copper cauldron found to date accompanied the deceased (Chechenov 1970).[28]

Among all undamaged graves in the north Caucasus, the grave of the large kurgan in the town of Maikop remains unmatched in the lavishness of its furnishing. In the centre of a 10 m high earth barrow, encircled with a stone revetment, was situated a spacious rectangular grave pit (5.33 × 3.73 m, depth 1.42 m). The walls of the pit were lined with wooden beams and its bottom was covered with a layer of pebbles. The grave was divided into two halves by a wooden frame, and its northern half was further subdivided into two. One adult individual lay in each tomb chamber, crouched, with arms bent and hands laid near the head.[29] The floor of the large southern chamber was covered with a thick layer of red pigment.[30] The individual in this chamber wore lavish necklaces of gold, silver, carnelian and turquoise beads; a dress adorned with gold rosettes, circles and animal-shaped appliqués; and a head cover decorated with two gold stripes and several smaller gold items. Weapons and symbols of power (four gold and silver bull figurines attached to metal rods, flint arrowheads and seventeen microlithic segments, bronze tools and weapons), sixteen vessels of precious metals with open and closed shapes, and eight fine spherical clay jars were placed around the body.[31] The bodies in the smaller northern chambers were decorated with gold and carnelian beads.[32] One of the small chambers contained a group of five middle-sized copper vessels, and the other a large clay pithos (Veselovskij 1897 [1997], 1900a).

A different kind of wealth was observed at the cemetery of Klady (formerly Tsarskaja). At Klady 31/5 an adult and a child were buried in a stone dolmen with two chambers. The north chamber, which contained the bodies, was packed with several layers of metal and stone objects.[33] In the south chamber were found five clay vessels, one of which contained animal bones. Some 4 m east of this grave was situated the so-called "sacrificial complex", a large concentration of finds including ochre, stag teeth, vessels, stone balls, bone sticks, stone animal figures, numerous arrowheads, whetstones, small bronze vessels, etc. (Rezepkin 2000, 66 f., Pl. 58 and 59). The dolmen excavated by Veselovskij in 1897 (Veselovskij 1901, Popova 1963) was very similar. The tomb chamber contained numerous items of decoration (gold rings; beads of silver, gold, carnelian, lapis lazuli, and rock crystal; gold and silver pins) and heavy copper implements (three copper chisels, seven flat and shafthole axes, nine daggers, a pokerbutt spearhead), a copper table set (three large cauldrons, three big forks, a scoop and two cups), and five clay vessels.

Information about the ages, sex, and health conditions of the individuals buried in the exceptional graves is very rare. Strikingly, such graves often contained two or three skeletons of adults and young adults, but individual graves of adults were also present.[34] Males and females alike were buried in lavishly furnished tombs. Klady 30/1, a stone cist with two chambers and a saddle roof, contained for example a female skeleton accompanied by copper daggers, crooked silver pins, black fur, and "sling balls" (Rezepkin 2000, 60). A rich grave containing a male skeleton was recovered at Klady 28/1. This adult male individual suffered violent injuries (Rezepkin 2000, 57).

Conclusions

The habitations of the Maikop period on the lower Kuban were characterized by simple architecture with short use-life. The communities inhabited dispersed homesteads of several discrete groups of buildings, "shifting" horizontally over a large area with changes in household size and composition. Political centres in the sense of fortified strongholds and trading or urban formations are completely absent to date. While investment in the domestic sphere was apparently very low, the Maikop communities spent considerable effort in the construction and maintenance of burial monuments. They not only built imposing earth and stone structures but also engaged in repetitive ritual activities at the burial sites, including feasting and enlargement of the mounds. The cemeteries possibly served as focal points of the social groups, for example for large gatherings and socializing, thus compensating for the rather weak settlement system. Differentiation in the graves documents socially acceptable wealth accumulation.

How can we explain the importance of cemeteries as stages for negotiating and reinforcing social relationships? Hayden (2009, 40) argues that not so much ideological but rather political forces underlie the association between lavish funerary feasts, large gatherings and social interaction – "[D]eaths of important family and lineage members create uncertainties as to the ability of surviving members to maintain previous social, production and political roles. Thus, it becomes important to demonstrate to allied kin, to the rest of the community and to regional affiliates that the surviving members' positions have not been adversely affected due to the loss of a prominent member. […] funerals are reaffirmations of lineage strength in the brokering of political power and the dominance hierarchy of lineages." For less influential families it is important to show vitality and attract allies. Smaller mounds in the north Caucasus indicate that "poor" families assembled resources at least to sponsor a modest feast and possibly to build a mound and thus to reaffirm and strengthen their social alliances. Monumental tumuli, on the other hand, suggest that the sponsoring of a spectacular feast, ending with animal sacrifice, a display of extraordinary wealth and the construction of a lavishly furnished monumental grave and mound might have been the essential means of sustaining the political dominance of powerful lineages. Grave goods, it seems, were intended to intimidate and impress allies and competitors alike (cf. Hayden 2009, 41).

Needless to say, the substantial quantities of food necessary to sponsor larger gatherings, lasting for several days, must derive from surplus produce. Thus, influential lineages must have been forced to generate and sustain a surplus considerably exceeding their immediate needs, either through economic intensification or through social mechanisms. Korenevskij (2004, 87) considers violence, exchanging of gifts and feasting to be the ideological sources of (male) political power in Maikop society. Which might have been the economic foundations of the political hierarchies? An intensification of the agricultural production appears less likely than a form of controlled "wealth finance", as the one suggested by Earle (1997) for the second-millennium BC chiefdoms in Thy, Denmark. In Earle's model, intensive cattle herding provided the means for prestige exchange and financing of specialized craftspeople. Control over pastures and access to highly valued objects was thus interrelated and regulated the relations of power in society. Given the paucity of archaeozoological studies, the exact role of cattle herding in the north Caucasus is difficult to assess. However, it is striking that the powerful symbolism of violence characteristic for some Maikop communities (see the section title "Social Valuables and Funeral Feasts" in this chapter) is never associated with fortifications or other indications for defensive concerns like inaccessible topography, nucleation, or defense of stored food, for example in fortified strongholds. Warfare was apparently not a threat for the domestic realm. Judging from the settlement data, it wasn't the power over a territory or a site itself but rather the control over pastures, animals and trading expeditions that appear to be the major cause for conflicts and the base of social inequalities during the Maikop period.

FARMERS AND PASTORALISTS ON THE LOWER KUBAN

Crops, Domestic Animals and Wild Resources

The Azov-Lower Kuban grassland, an expanse of coastal flatland with sufficient rainfall and an appropriately long growing season, provides all necessary conditions for rain-fed grain cultivation. However, water and wind erosion in areas unprotected by vegetation, coupled with the high rates of evaporation and severe unpredictable droughts that are typical for the steppe, turn most areas except the main watercourses into marginal agricultural land.

It is generally believed that prehistoric farming technology in the north Caucasus was simple and plant cultivation was not intensive. Korenevskij (1993b, 22), for example, assumes a form of shifting cultivation that was based on simple hoe tillage and frequent movement of the community to new fields after exhausting the soils in the vicinity of the old village. Unfortunately, supporting data about the agricultural practices of the north Caucasian communities during the fourth millennium are very scarce. Most significantly, archaeobotanical finds are nearly absent in the archaeological record.

The major staple crops were probably the cereals, since microwear on ground stone tools and on numerous flint blades demonstrates cutting and grinding of grasses and their seeds (Hamon 2007, 192; Poplevko 2005, 212; 2008a). However, these were not necessarily wheats. Traditional agriculture in the north Caucasus, as described in ethnographic accounts, was not based on the cultivation of wheat and barley: millet was the main and often only staple cereal of Kabardans, Cherkessians and other north Caucasian people, who grew numerous different sorts of this crop (wheat was only slowly and often forcefully introduced by the Russian government during the late nineteenth century) (Kaloev 1981, 85–87, 92 f.). In prehistory, millet was cultivated in Dagestan and in the south Caucasus during the sixth millennium BC (Lisitsyna 1984, Table 2). Prehistoric evidence for millet in the north Caucasus is also available, but still very scanty. Kantorovic and Maslov (2008, 160), for example, report about a jar with imprints of millet grains from a grave at Marinskaja in the region of Stavropol.

The antler hoes, characteristic for farming in southeastern Europe (see Chapter 6), are absent among the archaeological finds of the north Caucasus. In contrast to hoes, flint inserts for composite cutting tools are very common finds. Numerous flint inserts used for cutting grasses were identified by microwear analysis of the material from Pkhagugape, Chishkho, Psekup and Sereginskoe (Poplevko 2004, 2005, 2008a; Lovpache and Ditler 1988, 116). The typical, 4–5 cm long narrow "blade-like flakes" and larger blades with parallel straight edges and saw-tooth retouches must have been inserted in wooden sickle handles, since no antler handles have been found. Some of the blades with typical "sickle gloss" in fact might have been used in threshing sledges. At first glance, similar to the inserts of the harvesting tools, threshing inserts are distinguished by stronger abrasion caused by contact with the earth – heavily worn and blunted edges, more irregular and matt "gloss", wider and randomly oriented scratches (Anderson 2004 et al., Table 1). Anderson identified microwear caused by threshing on so-called Canaanean blades in southwest Asia, traditionally interpreted as sickle inserts (Anderson et al. 2004). Admittedly, no north Caucasian finds with such usewear have yet been reported, but the very large number of "sickle" blades raises doubts about whether some were possibly utilized as inserts in a tribulum.

The floodplains of the lower Kuban and the Azov steppe are rich in year-round grazing. Unfortunately, the archaeozoological data from this region are insufficient for reconstructing the practices of animal husbandry during the Maikop period. The only site for which faunal data have been published is Pkhagugape. Cattle were the only domestic species in this small assemblage of 108 animal bones (Spasovskij 2008). More data are available from sites located in the Caucasus piedmont. In the assemblage from Novosvobodnenskoe, comprising 2351 bone fragments, cattle predominated over the caprinae and pigs. Several sites in other parts of the north Caucasus yielded similar results – most numerous were cattle bones, slightly lower were the numbers of bones of small ruminants, and pig bones were rare (Korenevskij 2004, Table 15).

Transhumance was practiced in historical times by several north Caucasian peoples, for example by the Karachay and Balkar (Planhol 1956). However, such practices are not securely attested for the Bronze Age. The absence or rarity of pig bones in the assemblages from the grassland areas is not necessarily an indication of mobile pastoral practices but might instead be the consequence of cultural preference and lack of suitable fodder. In the complete absence of data about sex and age composition of the herds, milk, wool and animal power exploitation remain questions for future research. Pottery "strainers" are common among the materials from the settlements (e.g. in Sereginskoe, Dneprovskij and Korenevskij 1996, 19, Fig. 7, and in Chishkho, Rezepkin 2004b, 15, Fig. 4) but there is no proof of their use in cheese making. Other vessel shapes that can be clearly related to milk processing are absent, while the wool fabric identified at Novosvobodnaja probably represents an import (see the section titled "Weaving Crafts" in this chapter). Wild asses (onagres and European asses) and horses were native to the north Caucasus in prehistory, though compelling evidence for the use of domestic equides is absent.[35]

Wild plants and small terrestrial animals, such as greens, roots, fruits, berries, nuts, and snails, may have played a significant role in the diet of communities inhabiting the grasslands along the lower Kuban. Moreover, before the environment was altered by the construction of dams and irrigation channels, Kuban was famous for its large stocks of migratory fish. Direct evidence of gathering terrestrial food and fishing is not available but hunting is well represented in the archaeological record.[36] Spasovskij (2008) identified several species of large wild animals in the bone assemblage from Pkhagugape, among them horse, red deer, and wisent.

Storage of Staple Foods and Food Preparation Habits

Village communities in the valley of the lower Kuban stored their staple foods, most probably cereals, in large ceramic vessels (Fig. 4.7). Rim and body sherds of sizable pithoi were found at Sereginskoe and Uljap (Dneprovskij and Korenevskij 1996, 6; Brileva and Erlikh 2011). Comparable vessels were in use in other parts of the north Caucasus, for example at Bolsheteginskoe, Ust Dzheguta, and Galjugaj (Kaminskaja and Dinkov 1993, 9; Nechitajlo 2006a, 70 f.; Korenevskij

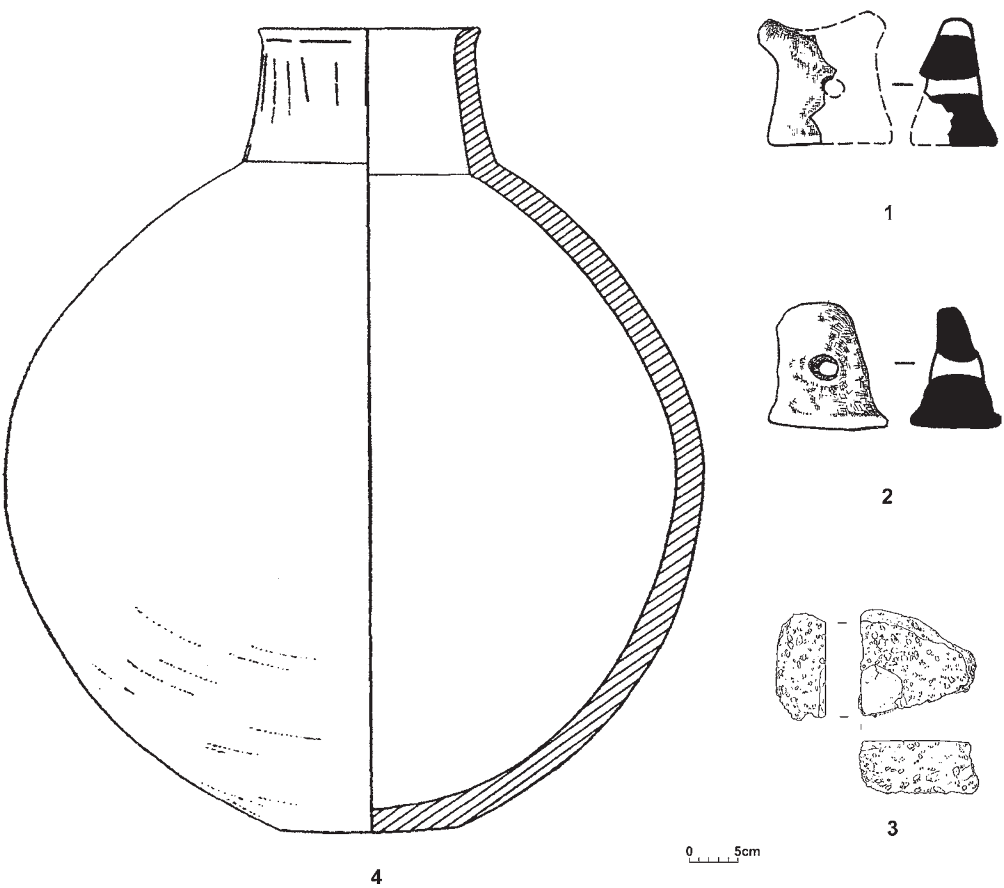

Figure 4.7 Clay "cones" from Sereginskoe (1–2), a stone saddle quern from Chishkho (3) and a large storage vessel from the vicinity of Grave 1/11 at Olenij (4). After Dneprovskij (1991), Rezepkin and Lyonnet (2007) and Gej (2008).

1995, 30–32, Table 1).[37] The large pits in the houses at Chishkho and Gorodskoj might have also served for storage purposes.[38]

In her investigation of stone tools from Chishkho, Hamon (2007, 192) observed on some stone tools traces of grinding cereals with a reciprocal movement that attest to their use as saddle querns. Granite saddle querns with smooth surfaces have been reported from Psekup, while a possible grinding stone with a very porous rough surface, manufactured from volcanic rock, has been found at Chishkho (Lovpache and Ditler 1988, 105; Rezepkin and Lyonnet 2007, 3, Fig. 41,) (Fig. 4.7).[39] The use of different grinding surfaces possibly hints at the production of different grades of flour and grits for preparing meals (e.g. bread, porridge, gruel, and semi-processed foods like bulghur). Neither pestles nor stone mortars with traces of cereal processing were found among the artefacts from Chishkho.

Communities of the Maikop period did not cook in domed ovens and clay hearth platforms, two cooking installations typical for southeast Europe at this time (see Chapters 5 and 6). Cooking was apparently performed in the circular clay-lined pits uncovered in the middle of most dwellings (see e.g. Rezepkin and Lyonnet 2007, 6) (Fig. 4.3). Although many of these pits were in a bad state of preservation, some displayed remains of a clay lining, or layers of charcoal, ashes and stones (Rezepkin 2004b, 10, Fig. 3; Rezepkin and Lyonnet 2007, 6, Fig. 2, 2).[40] These installations are reminiscent of the tandoor/tannur, the traditional oven in southeast Asia and the Middle East. A tannur is an installation with a cylindrical shape and a depth of c. 1 m, opened at the top and usually set into the floor. Tannurs are fuel-efficient and versatile installations that can be used for moist-heat cooking in a cooking pot over the fire, dry-heat cooking on hot stones and charcoal on the bottom after the fire has burned down, and baking flat bread on the hot clay-lined walls of the pit.[41]

Further furnishings related to the cooking installations were possibly the clay rings and the so-called "clay cones" found in the houses (Fig. 4.7). Psekup yielded clay rings which were used possibly as rims for the pit ovens (Lovpache and Ditler 1988, Pl. XI and XII), while many fragments of clay cones were found around the pits in nearly every house at Psekup, Sereginskoe, Gorodskoj, Pkhagugape, Pshikujkhabl and Chishkho (Korenevskij 1995, 57; Dneprovskij 1991, 9, Fig. 11; Dneprovskij and Korenevskij 1996, Abb. 1; Rezepkin 2004b; Rezepkin and Poplevko 2006, 3–6, Fig. 2; Rezepkin and Lyonnet 2007).[42]

Weaving Crafts

Clay discs with a raised collar originated from several habitation sites in the area of the lower Kuban (Pkhagugape, Pshikujkhabl and Chishkho; Rezepkin and Poplevko 2006, 1, Fig. 2; Rezepkin and Lyonnet 2007, 3, Fig. 25; Trifonov 2004, 168). Similar finds are typical for the Chalcolithic and Kura-Arax periods in the south Caucasus (Kushnareva 1993, Fig. 15, 16, Fig. 22, 3, Fig. 25, 20). Despite their suggestive shape, these artefacts were most probably not models of wagon wheels. First of all, finds of other miniature wagon parts or depictions of the wagon have not been found in the north Caucasus. Moreover, ethnographic descriptions and artefacts demonstrate that objects with identical shapes and sizes were actually designed and used for spinning; slender disc whorls possess a large radius combined with a low weight, which gives them the advantage of a longer spin and thus higher efficiency in comparison to other whorl shapes (Loughran-Delahunt 1996). The hub has the same function as in wagon wheels; it stabilizes the joining of whorl and spindle shaft. Along with disc whorls, clay spindle whorls with a rounded biconical shape were also in use, as demonstrated by a find from Gorodskoj (Rezepkin and Lyonnet 2007, 1, Fig. 8).

Actual remains of fibres and textiles from the lower Kuban have not been studied yet. However, the investigations of Shishlina et al. (2002) on textile finds from the cemetery of Klady/Novosvobodnaja in the piedmont area produced intriguing insights into the textile production of the Maikop period. Two of the samples originate from Dolmen 2, uncovered by Veselovskij in 1898. The remaining two textile fragments were recovered during Rezepkin's excavations in 1979–1980 in Kurgan 31/5. The textile samples from Klady 31/5 consisted of very fine, 0.15–0.30 mm thin linen fibres. The threads were spun, plied, and dyed in two different hues of brown. In contrast, the fabric from Dolmen 2 was woven from a mix of wool with a plant fiber, possibly cotton. The wool fibres (and not the threads) from Novosvobodnaja were dyed in three hues from dark brown to beige with a tannin-based dye by means of a technique suitable for animal fibre. The warp threads were spun with an S-twist and plied, while the weft was not plied. Both warp and weft threads were of excellent quality and extremely fine, with a thickness of only 0.04–0.08 mm (Shishlina et al. 2002, 254).

Cotton was very rare in the Old World during the fourth millennium BC and was not grown in the north Caucasus even in historical times.[43] Shishlina et al. (2002, 258) consider the cotton fibres from Klady an import. The beginning of wool use and the breeding of woolly sheep remains a controversial topic. Change in herding strategies recognized at several fourth-millennium sites in southwest Asia may represent the earliest indication for breeding woolly races.[44] Moreover, at several Late Uruk–related sites in the valley of the Upper Euphrates, archaeozoologists detected the appearance of a new breed of robust sheep, presumably the woolly sheep.[45] The earliest actual remains of a wool textile have been recovered at Shahr-i Sokhta I and date to the last centuries of the fourth millennium BC (Good 1999, 61, 110, Table IV). Notation tablets from the Late Uruk levels at Uruk Warka with the designation of "woolly sheep" provide textual evidence (McCorriston 1997, 521).

The linen fabric from Kurgan 31/5 at Klady was woven on a loom in plain weave (1/1 interlacing). By alternating warp threads of different brown hues, the finished cloth acquired vertical brown and beige stripes (Shishlina et al. 2002, 255). This linen fabric might have been manufactured on a relatively simple two-shed vertical or ground loom. It appears impossible to further clarify the construction of the weaving implement. Clay loom weights have not been found at sites of the Maikop period. They are absent in the south Caucasus and in larger parts of southwest and central Asia; therefore, the use of a ground loom in these regions seems plausible.[46] However, the presence of the vertical loom in the north Caucasus, either with warps attached to a bar or with weights made of unfired clay, cannot be excluded.

The fabric from Dolmen 2 was definitely not manufactured on a heddle loom, since its warp threads were twined (twisted) (Shishlina et al. 2002, 254 f., Fig. 1, 3). The twisting of the warps cannot be achieved through a shed created with a heddle and indicates the use of a tablet loom, a device suitable for creating narrow strips of cloth. In tablet weaving, the warps pass through holes in a number of small cards and the sheds are opened by rotating the cards at 180° each time a weft thread passes between the warps. The tablet-woven fabric from Dolmen 2 was a very fine, light and transparent gauze type of cloth. It had a pattern of vertical stripes of light beige and dark brown created by warp threads of two colours. Rather than originating from a garment, the fragments must have belonged to narrow strips used as bandages to wrap the body. They were coloured with a red mercury-based pigment (montroydite, HgO), possibly by sprinkling the wrapped body of the deceased during the burial ceremony. Montroydite is a very rare mineral, known for instance from a deposit in Turkmenistan (Shishlina et al. 2003, 337). As already mentioned, the cotton fibres used for the cloth from Dolmen 2 at Novosvobodnaja were also of foreign, possibly central Asian, origin.

In summary, the two graves at the cemetery of Klady/ Novosvobodnaja yielded evidence for two distinct technological systems of textile manufacture. Flax fibres, spun and plied, were dyed and woven on a two-shed (ground) loom. The studied samples from Grave 31/5 were manufactured in a plain weave technique with warp threads of two different brown hues. This fine linen fabric was most probably woven by local northern Caucasian craftspeople. A completely different technology was employed in the production of the cloth from Dolmen 2. The blend of wool and cotton, the dyeing of the fibres (and not threads), the exquisite quality of the threads, the unusual size of the cloth and the delicacy of the fabric, the use of a tablet loom and the sprinkling of the cloth strips with a rare red pigment all point to an entirely distinct textile tradition. Thus, not the fibres, but rather the whole finished fabric from Dolmen 2, as Shishlina et al. (2002, 258) cautiously suggest, may have arrived to the north Caucasus as a trade commodity.

Lithic Technology

The inhabitants of the lower Kuban exploited small- and medium-sized nodules from the secondary sources of flint available in the nearest vicinity of their settlements. They preferred the so-called Kuban flint, a semi-translucent material with brown colour and good knapping qualities (Nechitajlo et al. 1997, 41). Among the flint tools from sites on the south bank of Krasnodar reservoir studied by Poplevko (2008a, 2008b), artefacts of brown flint predominated and grey flint of lower quality was rare. Obsidian was not in use in this region. The obsidian sources at Baksan in the central part of the north Caucasus were exploited during the Maikop period, as demonstrated by finds of tools from graves in this area

(Korichevskij and Kruglov 1941, 59). However, the circulation of obsidian was apparently restricted to the vicinity of the sources.[47]

Research on the lithic assemblages from the north Caucasus is limited to typology and function, and the publications do not report details about the knapping technology of the Maikop period. Tools illustrated in the publication of Chishkho suggest the use of an expedient core technology, producing mostly irregular crude flakes (Fig. 4.8). Prepared cores were used mainly for producing long regular blades for sickle inserts, for example at Sereginskoe (Poplevko 2004). The working edges of the large sickle inserts were finished by a characteristic saw-tooth retouch (Lovpache and Ditler 1988, Pl. XX; Poplevko 2008b, Pl. 14). Another typical flint tool of the Maikop period is the "asymmetrical" arrowheads, some covered with exquisite surface retouch (Fig. 4.8). The graves in Kurgan 3 at Baturinskaja, at Novokorsunskaja and at Psekup contained from one to ten pieces of these remarkable arrowheads (Sharafutdinova 1980, 19; Trifonov 1991, 31, Fig. 6; Lovpache 1985; Rezepkin 2000, 74).[48] Furthermore, microlithic segments have been reported from Grave 5 at Uljap (Eskina 1996, 11–27, Fig. 1). These microlithic tools represent an oddity, whose only parallel originates from the unique grave at Maikop (see Stoljar 1996, 62; Ostashinskij 2008, 57).

Artefacts of common stones are not numerous among the finds of the Maikop period. Tools for grinding, crushing and polishing, bearing only minor traces of shaping, for example saddle querns, crushing stones, stone palettes, and polishers, were found infrequently in the settlements (Hamon 2007). Flat stone axes are virtually absent, while hammers and hammer-axes with a shafthole, like those from the settlements of Psekup and Chernyshev and from a damaged grave at Taujkhabl/Chishkho, are exceptional finds (Lovpache and Ditler 1988, 105; Bianki and Dneprovskij 1988, 74, Fig. 3, 8; Rezepkin 2000, 71 f., Pl. 77, 4). A small whet-stone with a hole was found in Grave 2 at Vozdvizhenskaja (Trifonov 1991, Fig. 6, 34).[49] Other notable stone objects are the long slender objects interpreted as sceptres, or less plausibly as whet-stones (see Korenevskij 2008b, 14).[50] A last group of stone artefacts are small stone beads: tiny white and black disc beads were recovered at Olenij 2/34, while beads of carnelian and rock crystal originate from Timashevsk, Dneprovskaja and Uljap (Gej 2008, Fig. 8, 2; Trifonov 1991, 107, Fig. 6; Eskina 1996). A large, though incompletely published collection of beads was found in a silver jar near Staromyshastovskaja (Veselovskij 1900b).

It remains obscure whether the north Caucasian beads of ornamental stones were manufactured locally or obtained by trade.[51] The carnelian cylinder seal found at Krasnogvardejskoe (Nekhaev 1986, Fig. 3, 1), however, was certainly an import. Not only were stone artefacts decorated by engraving unknown in the Maikop period,

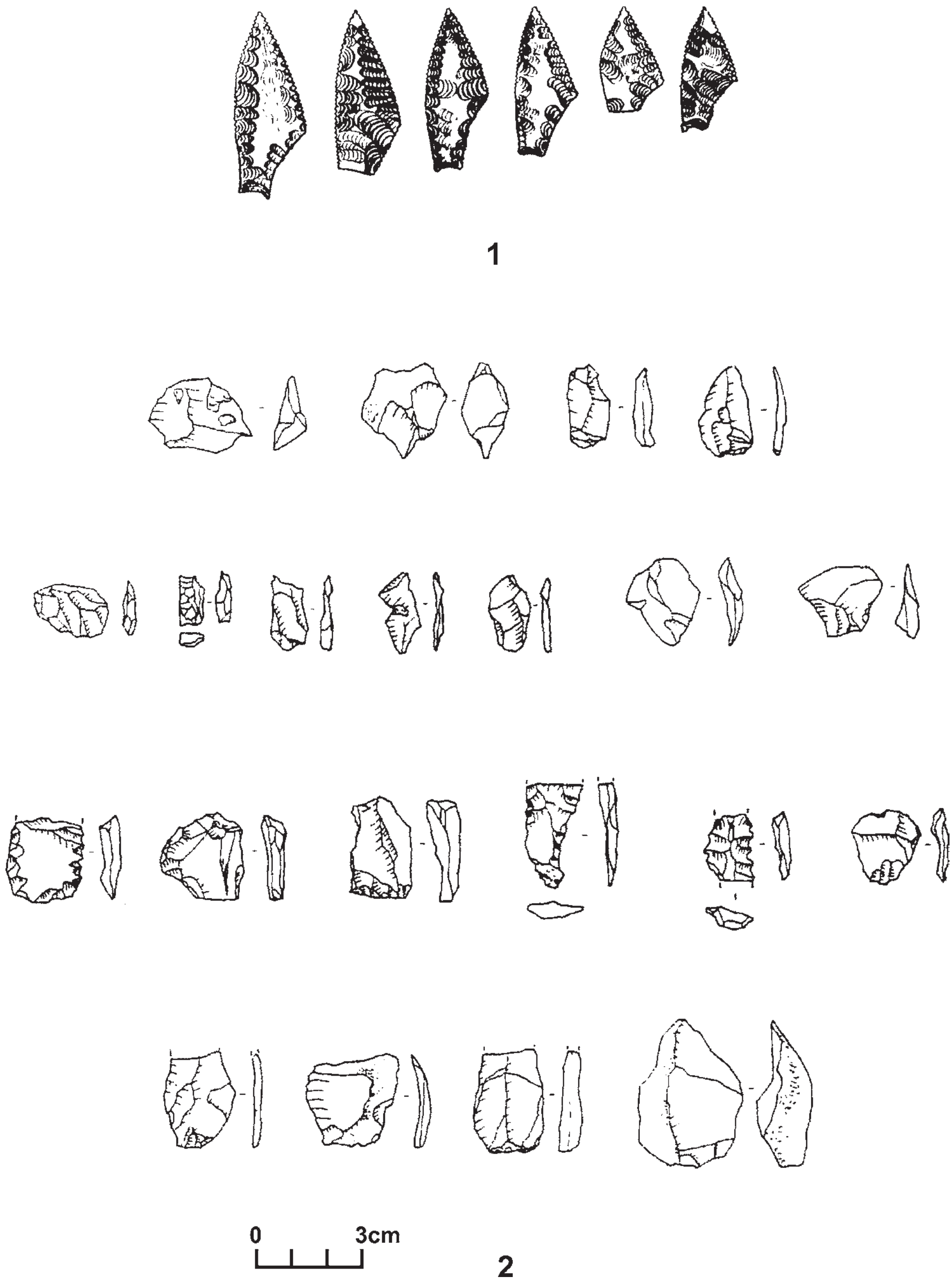

Figure 4.8 Flint artefacts from Grave 2 at Psekup (1) and House 3 at Chishkho (2). After Lovpache (1985, Pl. IV, 9–15) and Rezepkin and Lyonnet (2007, Fig. 38).

but the practice of sealing was also completely foreign to the north Caucasian societies.[52]

CERAMIC VESSELS AND FAIENCE

Pottery

The potters of the Maikop period prepared coarse clay bodies by adding mineral opening materials in different quantities, depending on the wall thickness, size and function of the intended pots (Dneprovskij and Korenevskij 1996, 5; Nechitajlo 1989, 30; Nechitajlo 2006a, 2006b). Along with sand, the second most common inclusions in the ceramics from Novosvobodnaja were large quantities of crushed shells (Popova 1963, 18 f.).[53] Fine clay bodies, in contrast, comprised levigated clay mixed with small pieces of straw. The straw filler was not visible on the surface, since fine vessels were covered with a thin clay slip; in the core, however, the traces of very small pieces of straw or chaff were clearly recognizable (Andreeva 1977, 44; Dneprovskij and Korenevskij 1996, 5). It has been suggested that the source of organic inclusions in fine ceramics was cattle dung rather than finely cut straw (Korenevskij 1993a, 22). Apart from its possible function for improving the plasticity of the clay body, traditional potters use animal dung simply as an accessible source of chopped straw (Miller 1985, 213). The adding of fine straw particles improves the qualities of fine clays for throwing or shaping on the wheel, and for firing (Miller 1985, 214; Mahias 1993, 165).

Coarse clay bodies were used for shaping by hand, most probably by means of coiling. Coiling was identified for example by Hamon and Lyonnet (2004) on pottery vessels from sites near the Krasnodar reservoir.[54] More problematic is the reconstruction of the techniques used for shaping vessels from fine clay. Korenevskij (2008a, 101 f., Pl. A) observed specific fine parallel lines on the necks and rim parts of round-bottomed vessels from Galjugaj and interpreted them as traces of working on the wheel. However, these traces do not necessarily derive from throwing. As demonstrated by Courty and Roux (1995), surface features do not prove *throwing* but only the use of rotational movement in the final stage of shaping. It is not possible to recognize the exact mode of use of the potter's wheel by visual inspection alone. Microfabric analysis of third-millennium vessels from Tell Leilan and Shahr-i Sokhta, for example, showed that the wheel was used basically for the finishing of coil-built rough outs (Courty and Roux 1995, 47 f.). The broad radiographic study of Laneri and di Pilato (2000) confirmed these results and documented an impressing diversity of creative combinations between hand building and wheel-turning. The pottery vessels in fourth-millennium Susa, although possibly finished on a potter's wheel, were shaped by hand with coils.[55] At Hacınebi, wheel throwing was introduced in the first half of the fourth millennium for only exclusive fine small-sized vessels; mass-produced wares were built of coils or moulded and only finished on the wheel. In the second half of the fourth millennium, the wheel was indeed employed for throwing mass ware but only for one small simple shape of cups.[56] Even during the early third millennium, the use of the wheel in southwest Asia was restricted to a few simple small-sized shapes, representing an insignificant portion of all ceramic products.

There are some indications that the vessels from the north Caucasus were produced in two parts and not thrown or turned in one piece.[57] Separate shaping of the neck and body is suggested by thickening and a groove at the point where the neck and vessel body meet (e.g. on vessels from Sereginskoe and Uashkhitu 1/10; Dneprovskij 1991, 7 f., Figs. 1 and 7; Dneprovskij and Korenevskij 1996, 11).[58] Shaping in parts involves different concepts of how a pot should be made in comparison to work in one-piece. It is not incompatible with the wheel but difficult to combine with "real" throwing.

A case of a two-step sequence involving the use of a potter's wheel, which can serve with some modifications as an orientation for reconstructing the Maikop utilization of the wheel, was observed and described by van der Leeuw (1993, Pl. 9.4) in the Philippines. Potters shaped the rim part of the vessel by hand, finished it on the wheel and allowed it to dry. At a later point, a clay "pizza" was added to the leather-hard rim part and the globular body was shaped out of it by a paddle and anvil.[59] In a faster sequence, the rim part was thrown on the wheel by centering and opening a clay cylinder. On its lower part, a thick lump was left unshaped and the cylinder was removed from the wheel. After the roughout dried, the potter shaped a wide globular body from the lump with a paddle and anvil. In another case study in rural south India, a combination of wheel throwing and paddle-and-anvil shaping was practiced in pottery workshops as a specialized activity. The forming of a pre-shape with a ready rim and shoulder section on the wheel took about three minutes, while the subsequent shaping of the round-based body was completed in up to thirty minutes, depending on the size of the vessel (Sinopoli 1991, 37 f.).[60]

In contrast to the potter's wheel, direct evidence for the use of the paddle-and-anvil technique in the north Caucasus is absent. However, the general form of the wide, globular, round-based jars of this region is characteristic of shaping by beating.[61] Moreover, studies of traditional pottery shaping methods suggest a strong relation between convex bottoms and the paddle-and-anvil technique.[62] The use of this technique creates a characteristic orientation of the mineral particles and voids in the vessel wall that can be detected on radiographic images (Rye 1977), but, regrettably, such investigations have not been conducted on pottery of the Maikop period.

In summary, we do have indications that potters in the north Caucasus used during the fourth millennium BC the potter's wheel, but no evidence that they were able to throw a vessel in a single operation from a lump of clay. The wheel was apparently utilized to produce or finish the rim part of jars whose round-bottomed lower part was probably shaped by hand.[63] Yet proficiency in the use of the potter's wheel, no matter if for "real" throwing or only for finishing hand-shaped rough-outs, requires considerable investment of time and effort. The craftsperson does not employ simple everyday gestures, as in hand shaping, but movements trained through long and arduous apprenticeship (Roux and Courty 1998, 750; Roux 1990, 144). It is therefore interesting to note that the north Caucasian potters working with the wheel apparently did not exploit their highly specialized and efficient craft to produce higher output of pottery containers for everyday household tasks. Instead, they preferred to make only a few distinct shapes of high-quality ceramics.

Vessels with plain undecorated surfaces predominate in the pottery of the north Caucasus during the fourth millennium BC. The surface can be slipped and burnished but decoration of incised, impressed and applied ornaments is very rare and restricted to the shoulders. A vessel from Grave 13 at Uashkhitu, for example, was ornamented with incised zigzag lines (Korenevskij and Dneprovskij 2003, Fig. 4, 4). Small bosses were applied to the surface of pots from Gorodskoj and Chishkho (Rezepkin and Lyonnet 2007, Fig. 8, 9; Fig. 37, 5), and a vessel from Kurgan 4 at Krasnogvardejskoe had a channeled surface (Munchaev 1994, Pl. 59, 5).

"Polished" decorations, most usually zigzag lines, were found on vessels from graves at Uashkhitu, on several vessels from the kurgan at Krasnogvardejskoe and from the settlement at Psekup (Korenevskij and Dneprovskij 2003, Fig. 4, 2, Fig. 5, 1; Nekhaev 1986, Fig. 2; Lovpache and Ditler 1988). According to Trifonov (2003), this decorative technique did not involve polishing but the use of a ceramic body and slip with different chemical compositions. The body was slipped and the ornament was scraped to the original surface. The vessels were then polished and fired. Due to the different firing qualities of the ceramic body and slip, a colour contrast (e.g. beige and red) emerged on the surface of the vessel after firing.[64] To explain the present appearance of the sherds, Trifonov suggests that, after deposition, the polished slip wore out and only the polished areas of the initial unslipped surface of the motives remained preserved. Trifonov believes that this decoration derived from the Mesopotamian "reserved-slip" ware. However, his reconstruction of the decoration technique and post-deposition surface change of the north Caucasian vessels, and thus the resemblance to the Mesopotamian "reserved slip" ornamentation, is completely speculative and needs further support by microfabric and experimental studies.

There are no special studies of pottery firing technology on the lower Kuban, but we can assume the widespread practice of open firing. Vessels with fine textures, even orange coloured surfaces and dark brown or black cores, such as the examples from Obshtestvennoe II (Sorokina and Orlovskaja 1993), were probably produced in open firing at low temperatures. A further group of vessels, characterized by shining black outer surfaces and brown cores and inner sides of the walls, was possibly fired under similar conditions and smudged by smothering with dung or grass at the end of the firing operation.[65] Black burnished vessels in the lower Kuban have been reported from Pkhagugape and Gorodskoj (Rezepkin and Poplevko 2006, 114; Rezepkin and Lyonnet 2007). Furthermore, Grave 2/18 at Novokorshunskaja contained three hand-made vessels with black surfaces and sand admixtures in the clay (Rezepkin 2000, 74).

The reliable manufacturing of completely oxidized, hard-fired pots with standard light and even surface colour without clouds and smudging generally requires the use of a potter's kiln. Examples of such vessels were found in all areas around the lower Kuban.[66] Indeed, kilns filled with broken pottery have been reported for

Pkhagugape and Area VIII at Psekup (Rezepkin and Poplevko 2006, 114, Fig. 1; Lovpache and Ditler 1988, 105, 108 f.). Both kilns belong to the same type of installation, an updraught kiln with two chambers divided by a slotted clay platform, in which the pots were arranged in the upper chamber and fired by heat coming up from fuel burning in the lower chamber, without coming into contact with the fire. The earliest kilns of this type appeared in north Mesopotamia in the late seventh millennium BC, though they became widely used only during the Ubaid period (see Hansen Streily 2000).[67] The oldest examples from Iran are the installations at Sialk III:1, Tall-i Bakun A, and Arisman dating to the fifth and early fourth millenniums (Boroffka and Becker 2004).[68]

One peculiar feature of north Caucasian pottery is the so-called potter's marks, combinations of incisions or impressions on the surface of the unfired pots. According to Korenevskij (1999, 8), potter's marks on the neck and shoulders are associated with a particular type of ceramics, the fine wheel-finished ware in the earliest pottery group of the Maikop period (Galjugaj-Sereginskoe).[69] On the lower Kuban, potter's marks on the neck and shoulders were reported for example for vessels from Sereginskoe (Dneprovskij and Korenevskij 1996, 4). Identical marks characterize the pottery of the late Chalcolithic period in Azerbaijan and Georgia (the "Leilatepe culture"), and the mid-Uruk period in north Mesopotamia and east Anatolia (Narimanov et al. 2007; Trufelli 1994).[70]

Traditional potters used comparable simple signs on the surfaces of unfired vessels as their individual trade mark to prevent confusion of pots during communal firings (e.g. the Ogoni people of Nigeria, Lovenge of Mozambique, and Kamba of Kenya) (Barley 1994; 128, Gill 1981).[71] In this case, the practice of marking the unfired pots is a consequence of the large-scale production of plain vessels and of standardization: the produce of the individual potters is so similar (standard) in size and appearance that it can get mixed up during communal drying, firing or marketing. In would be erroneous, however, to see standardization simply as the outcome of craft specialization. Ethnographic cases draw attention to the fact that the standard shapes and colours of vessels can have particular "functions", for example to help consumers recognize a good-quality "reputable" pot (see Sillar 1997, 14). Moreover, it cannot be excluded that, instead of simply denoting the identity of the potter, the marks on the north Caucasian vessels represented a part of a much more complex system for information coding. Marks may be used to disclose the purpose of the vessel (e.g. when the shaping of a large number of similar pots is followed by marking those intended for use on a particular occasion, a transaction or a feast), its specific qualities (size, volume, content) or even to convey a more elaborate combination of meanings (e.g. a beer jar or a cooking pot produced for a specific feast).[72] The presence of nearly identical marks in a very extensive area, encompassing Greater Mesopotamia, the Anatolian highlands, and the Caucasus, supports the supposition that these marks were not simply the "signatures" of individual potters but represented an element of a more complex system of signs for communicating information.

In summary, the ordinary ware of the Maikop period was hand-shaped from a coarse clay body with mineral filler. The vessels had thick walls and were fired in an open firing to red, yellowish, and brown surface colours. Pots with black burnished outer surfaces were also buff in the core and on the inside. The hollow shapes of this coarse ware include flat-bottomed jars with low or high necks, "tulip-shaped" beakers, cauldrons and pithoi (Fig. 4.9, 1–6). A common flatware form is the rounded bowl with a small flat bottom (Fig. 4.10, 1–7). Apart from two small lugs on the shoulders, componential pottery (e.g. ring bases, legs, high pedestals, spouts, handles) is absent. The coarse ware was used for cooking (jars, cauldrons), storing solids and liquids (jars), and as table ware (bowls, black polished cups and beakers). Pots belonging to this ordinary ware were found among the material at Pkhagugape and Gorodskoj (Rezepkin and Poplevko 2006, 114; Rezepkin and Lyonnet 2007) (Fig. 4.10). Moreover, Grave 18 at Novokorshunskaja included two hand-shaped vessels with black surfaces made of clay with sand admixtures (Rezepkin 2000, 74) (Fig. 4.15 later).

The north Caucasian potters also produced a second, distinct ceramic ware with very fine chaff-tempered clay bodies, thin walls, an orange-red or grey surface colour, round-bottomed shapes, and polished undecorated surfaces bearing traces of wheel finishing and potter's marks (Fig. 4.9, 7–11). The majority of vessels seem to have been made by using the potter's wheel and fired at high temperatures in a kiln.[73] This second ware was characterized by faster shaping combined with superior control of shape, wall thickness and colour. On the negative side, its production required long learning periods, difficult motor habits and uneconomical methods of firing. Typical hollow shapes of the fine ceramics are jars with spherical bodies, rounded bottoms and a low neck and spherical round or flat-bottomed cups with high narrow necks. The flat shapes are represented by rounded and biconical bowls. Componential pottery

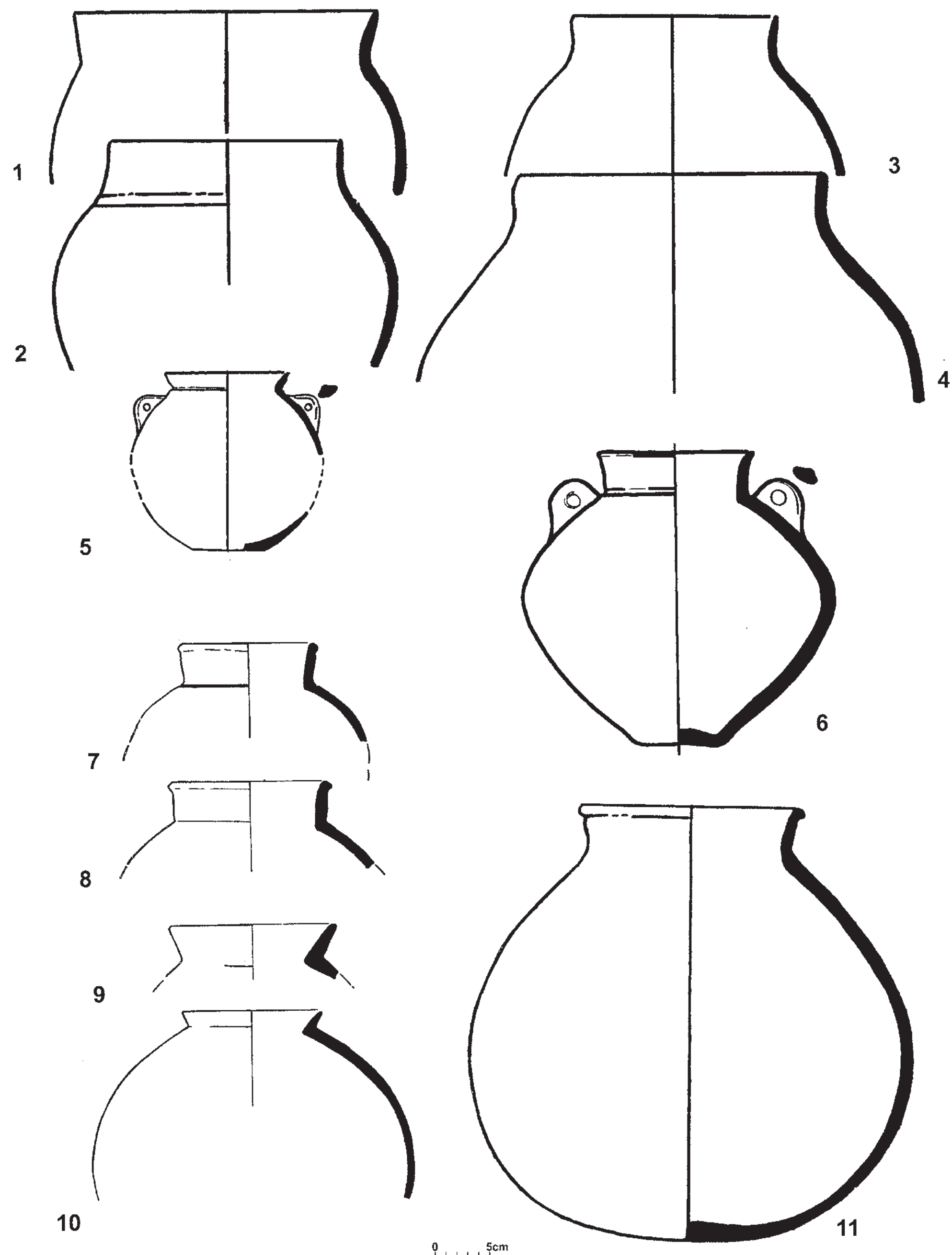

Figure 4.9 Coarse hand-made ware (1–6) and fine wheel-shaped ware (7–11) from Sereginskoe. After Dneprovskij (1991, Figs. 2, 3 and 6).

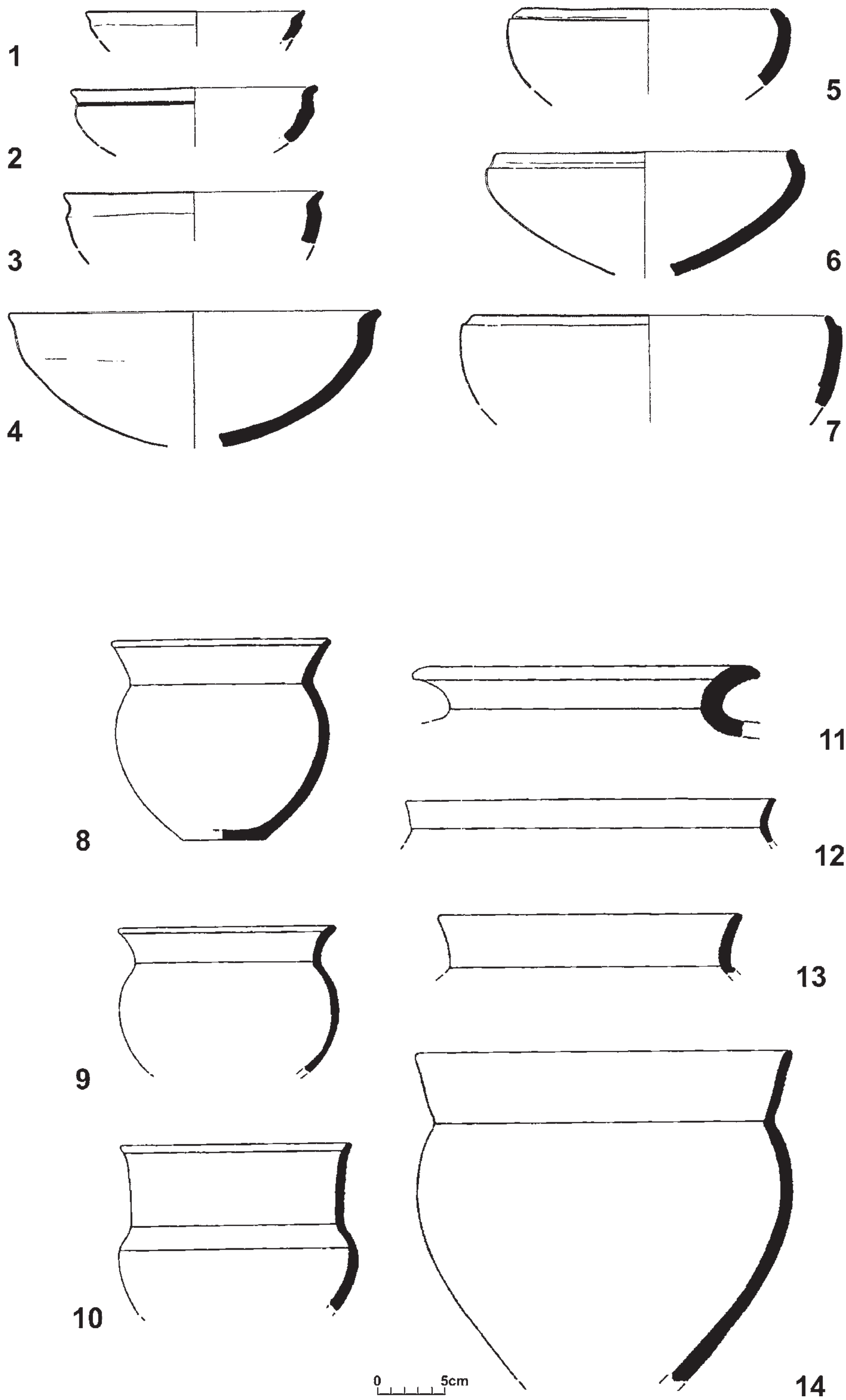

Figure 4.10 Pottery from Sereginskoe (1–7) and from House 5 at Gorodskoj (8–14). After Dneprovskij (1991, Fig. 4) and Rezepkin and Lyonnet (2007, Fig. 3).

is absent, with the exception of vessels with two small lugs at the junction of the shoulders and neck (e.g. at Sereginskoe; Dneprovskij 1991, Fig. 6, 1–3, 5–8). The vessels are suited for serving liquids (cups and beakers), serving and short-term storage of solids (spherical bowls), and storage of solids and liquids (necked jars).[74] This ware was found in the area of Krasnodar reservoir and on both sides of the lower Kuban.[75]

Faience

Faience is an artificial substance consisting of fused siliceous material. The ingredients, generally silica, alkali and colouring substances, are finely ground to powder, mixed with water and kneaded in a mass from which the craftsperson shapes objects by hand or with a mould. After drying, the objects are heated to 800–950 °C, which is sufficient to melt their surface but not to cause the complete fusion of the ingredients in the core (Henderson 1985, 270; Moorey 1985, 133 f.; Moorey 1994, 167). Finds of faience beads have been reported for several sites on the lower Kuban. Graves at Uljap and Obshtestvennoe II yielded small cylindrical and round beads of "white paste" (Bianki and Dneprovskij 1988; Eskina 1996; Sorokina and Orlovskaja 1993, 232). Moreover, the hoard of Staromyshastovskaja apparently included hundreds of faience beads (Veselovskij 1900b).[76] Faience technology was also reportedly used for manufacturing cores for beads of gold and silver sheets (see Rezepkin 2000, 63). However, given the absence of spectrographic analyses, the identification of all the previously mentioned materials as "faience" has to be treated with caution.[77]

The north Caucasus may belong to the areas of earliest faience technology in the Old World. Faience production began with small beads during the Ubaid period in north Mesopotamia and became very popular in the subsequent Uruk period (Moorey 1994, 171–173).[78] White paste beads were very common in the graves at Gawra XIII-XI (Late Ubaid/Early Uruk), while faience stamp seals and faience inlays in stone seals were found in settlement layers at the same site (Tobler 1950, 88, 178). At the end of the fourth millennium, faience was used in Mesopotamia, Iran and in Eastern Anatolia for the manufacturing of complex bead shapes, amulets, animal-shaped stamp seals, and even small vessels.[79] In the south Caucasus, silver foil beads with faience cores were found at the early fourth-millennium cemetery Soyuq Bulaq (Akhundov and Makhmudova 2008, 64). The seventy-nine white faience beads from a grave of the early Kura-Arax period at Gegharot in Armenia may date somewhat later.[80] Against this background, the presence of faience technology in the north Caucasus appears probable, and systematic archaeometrical studies in the future can provide interesting insights into the origin and spread of this unusual technology.

METALLURGICAL INNOVATIONS

Mining, Beneficiation and Smelting of Ores

The northern slopes of the main Caucasus range are very rich in metal ores, especially deposits of non-ferrous metals. Belorechenskoe, a major copper source in the upper course of Belaja, is situated only c. 60 km south of the town of Maikop. Copper deposits are abundant in the upper and middle courses of the Laba, Zelentchuk, and Teberda Rivers (Ryndina et al. 2008, 203).[81] Silver-containing lead ores are abundant in the upper course of Kuban (Kondratieff 1894), while alluvial gold deposits are found in the western part of the main Caucasus range in the valleys of Zelenchuk, Laba and Belaja (Volkodav 2005).[82] However, archaeological research at potential ancient mining sites has not yet taken place. To the south of the main range, excavations at Bashkapsara in the area of the Adange pass in Abkhasia revealed open mines, stone hammers and pottery (Bzhania 1988). Samples of wood from this mining site provided radiocarbon dates ranging from the beginning of the third to the first millenniums BC (Bzhania 1988, 9).

The provenance of the copper used by north Caucasian metalworkers was studied only through spectrographic analyses of finished objects. Chernykh identified in the 1960s two types of copper differing in their chemical content – one containing arsenic and nickel and the other only arsenic. Chernykh assumed that the composition of the metal objects corresponded to the original composition of the ores from which the metal was smelted. Since polymetallic ores, which could yield the identified types of metal, are not known in the north Caucasus, he was convinced of the foreign provenance of the raw material. For the origin of the arsenical copper he suggested sources in the south Caucasus; the metal containing nickel was supposedly of Anatolian origin.[83] Chernykh hypothesized that the wealth of the Maikop culture arose from its role as an intermediary in the copper trade between the south Caucasus and the steppe areas of Eurasia (Chernykh 1992, 159–160). However, other interpretations of his analytical results are also possible. Galibin (1991), for example, suggested that nickel and arsenic did not originate from the copper ore but were added during the process of smelting. He considered the possibility of exploiting the abundant local ore sources in the north Caucasus, for example the Belorechenskoe mining area that contains both copper, arsenic and nickel minerals.

While direct evidence for mining in the north Caucasus is absent, the practice of collecting and processing minerals is indirectly attested by the study of microwear on stone tools. Hamon investigated the use-wear traces on tools from the sites Chishkho and Gorodskoj, near the Krasnodar reservoir. On some rectangular and oval stone plates she recognized traces caused by grinding minerals with a circular movement (Hamon 2007, 192). Moreover, several hammer stones demonstrated traces left by crushing very hard substances. The characteristic V-shaped section of these traces has been observed on artefacts found in ore processing contexts at other sites and are presumably associated with the practice of crushing ores or slags (Hamon 2007, 195). However, given the lack of referential material at the time of her study, Hamon was not able to identify the materials processed at Gorodskoj and Chishkho beyond doubt.

Thus, the presence of ore deposits, the chemical composition of some copper artefacts, and the tentative evidence for mechanically processing ores speak for the local smelting of metals from ores in the region of the lower Kuban. Unfortunately, direct evidence for smelting in the form of installations and finds of ores, slags, or crucibles has not been reported from sites of the Maikop period. In the absence of any relevant materials, smelting technology in the north Caucasus remains obscure. A remarkable object with an irregular rectangular shape (7 × 3 cm) has been found at Klady 31/5 (Rezepkin 2000, 63, 66). If this object was indeed a smelting ingot (*Gusskuchen*), as suggested by the excavator, and not the result of the re-melting of copper or a collection of copper prills baked together, it would suggest smelting in a crucible or possibly even the use of a small shaft furnace with successful separation of the metal from slag. Smelting in shaft furnaces would indeed fit the large-scale production of copper visible in the north Caucasian assemblages.

The earliest evidence for copper smelting in the Middle East dates to the end of the sixth millennium BC. Layers I and II at Tal-i Iblis in southeastern Iran, radiocarbon-dated to the late sixth and early fifth millenniums BC, provided large quantities of crucible fragments and pieces of ores originating from the vicinity of the site (Pigott and Lechtman 2003; Frame 2004).[84] Contemporary evidence for smelting and melting copper is available from the Upper Euphrates, where excavations at Değirmentepe recovered copper pieces and prills in an inner court of Level 7, dating to the transition between the Halaf and Ubaid periods (Esin 1986, 145; Schoop 1995, 110). Finds of slagged crucibles and smelting slags containing copper prills are more common at sites of the later fifth millennium BC, for example at Cheshme Ali, Değirmentepe, Norşuntepe, and Tülintepe (Matthews and Fazeli 2004, 65; Esin 1985; Yener 2000, 39; Yalçın 2000b, with references; Müller-Karpe 1994, 17–21, 25).[85] These early remains of copper ore processing suggest that smelting took place in a ceramic crucible which was possibly placed in a shallow pit and heated from above by means of forced draught (see e.g. Frame 2004, 23, Fig. 6.3).

Crucible smelting can be a quite inefficient technology for smelting low-grade ores. Depending on the composition of the ore and the conditions of smelting, metal prills can remain entrapped in the partially molten and solidified slags and have to be laboriously handpicked from the crushed slags.[86] By the end of the fourth millennium, however, some prehistoric communities in Iran and Anatolia had already mastered the separation of metal and slags in one operation. A change from copper smelting in crucibles to small shaft furnaces probably took place on the Iranian plateau around the middle of the fourth millennium BC. Based on the composition and structure of slags from Tepe Hissar, Thornton (2009, 180) argues that furnaces were in use at this site at least from the mid-fourth millennium onwards. Moreover, the metallurgical remains from Tepe Hissar testify to the practice of skillful separation of slags from metal product (Thornton 2009, 147). Numerous furnace wall fragments were also found in slag heap D at the smelting site of Arisman, while slag heap A at the same site was associated with an intact and repeatedly used shaft-furnace. Both slag heaps included material of the Sialk IV.1 period dating to the last centuries of the fourth millennium BC (Weeks 2009, with references; Chegini et al. 2000, 294–298; Pernicka 2004b, 236). Another early smelting site at Murgul near the Black Sea coast south of Hopa included huge slag heaps that have been radiocarbon-dated to the second half of the fourth millennium. The shape, size and chemical composition of the slags documented the practice of deliberate fluxing and efficient separation of slag and copper, most probably in a simple shaft furnace (see Chapter 7).

North Caucasian metallurgists processed not only copper but also silver and gold. However, the provenance of these two precious metals as well as the technology of their extraction have not yet been directly addressed through chemical analyses. The relative abundance of silver objects suggests the use of cupelled or smelted metal, since native silver is very rare and is found only in small quantities in nature (Moorey 1985, 107). There are two possibilities of obtaining silver from ores – either from silver ores by direct smelting or from argentiferous lead ores by the process of cupellation. Cupelled silver generally contains lead in concentrations above 0.05 per cent (Craddock 1995, 213). Most objects from the cemetery at Klady, the only silver artefacts from the north Caucasus that have been subjected to chemical analysis, do not contain lead but often include a few per cent of gold and copper (Galibin 1991).[87] Only two finds, a pin (Nr. 159–26) and an appliqué (Nr. 156–36), showed higher concentrations of lead. The absence of lead working, a typical by-product of silver production by cupellation, also speaks against the large-scale exploitation of argentiferous lead ores in the north Caucasus.[88] Thus, until more abundant and detailed analytical data become available, one can tentatively conclude that the metallurgists of the north Caucasus did not regularly practice cupellation but used either native silver or, most probably, smelted silver from its "dry ores".[89] Along with silver, metalworkers of Maikop used electrum, a natural alloy of gold and silver.[90] Electrum can originate from both primary and placer deposits and sometimes contains copper.[91]

Alloying

Artefacts of "pure" copper are uncommon in the north Caucasus. The great majority of the copper objects contain arsenic, and one-third of these "arsenical bronzes" include an admixture of nickel in concentrations above 0.1 per cent.[92] In the 1960s Chernykh (1966, 49) proposed that the admixtures of arsenic and nickel were present in the polymetallic copper ores smelted by the prehistoric metallurgists. Korenevskij (1988, 92 f.) was one of the first to raise doubts that metal was obtained from copper ores containing nickel. Furthermore, Galibin (1991, 60) pointed out that such ores are very difficult to smelt. It seems more plausible, according to these researchers, that the mineral nickelin (NiAs) was added to copper. The Belorechenkoe ore deposit in the valley of the river Belaja, for example, contains both copper and nickelin.

Arsenical copper was an innovation of the fifth millennium BC. Among the earliest indications for the use of arsenical copper in the Old World are the finds of copper arsenate ores and traces of arsenic in copper prills on the slagged surface of clay crucibles from the early-fifth-millennium site Tal-i Iblis (Pigott 1999a, 110–112; Frame 2004). In the late fifth millennium arsenical copper became more widely spread. Evidence for its use originates from the Iranian plateau, the Kopet Dag piedmont, the Upper Euphrates, the south Caucasus and the northern Negev.[93] An awl from the Tepe Yahya VIA (c. 4300 BC) is one of the earliest objects containing significant impurity (1,43 per cent arsenic) (Thornton et al. 2002; Thornton 2010). Moreover, analyses of slags and other metallurgical debris from Ubaid layers at Değirmentepe and Norşuntepe demonstrated smelting of polymetallic ores containing arsenic (Müller-Karpe 1994, 20; Yener 2000, 58 f.). Two artefacts of arsenical copper dating to the fifth millennium BC were identified among the metal finds from Kjul Tepe in Nachchevan (Akhundov 2004).

Arsenical copper became widespread and eventually replaced unalloyed metal in central and southwest Asia only during the early centuries of the fourth millennium BC.[94] Arsenical copper with a nickel impurity spread simultaneously.[95] In Susa I, for example, one-third of the analysed artefacts contained not only arsenic (1.6% on average) but also nickel (1.1% on average), the latter interpreted as an impurity connected with the arsenic (Pigott 1999b, 80).[96] During the late Uruk period, nickel-containing copper was very common in the Levant, Eastern Anatolia, Mesopotamia and Iran.[97] Although arsenical copper appeared in Eastern Europe during the first quarter of the fourth millennium, nickel has not been found in artefacts from this region (see Chapter 6).[98]

The exact technological process used for alloying copper and arsenic in prehistory remains uncertain. When heated to temperatures greater than 457 °C, arsenic oxidizes to highly toxic and volatile arsenic trioxide. Thus, adding directly an arsenic-bearing mineral to molten copper involves a serious health risk and requires very cautious handling and covering of the reaction vessels. Less hazardous is alloying by co-smelting (the smelting of oxide copper minerals together with arsenic-bearing sulphide ores of copper), which, under certain conditions, can produce arsenical copper without significant oxidation of arsenic (as confirmed experimentally by Lechtman and Klein 1999). Another similar method is the mixing of copper ores and arsenic minerals in the charge of the smelting installation.[99] Among a wide variety of arsenic-bearing minerals, nickelin (NiAs) is possibly the safest, as demonstrated by experiments for reducing nickelin with copper oxide ore (malachite) at 1100–1200 °C in laboratory conditions, which produced alloys without loss of arsenic in the form of poisonous fumes (Ryndina et al. 2008, 200). It seems probable that the two basic types of arsenical copper, described previously, were indeed the products of the latter two distinct smelting processes, the one involving a mixed charge of copper oxides and an arsenic-bearing copper sulphide ore (co-smelting) and the other copper ore and nickelin. From the two, co-smelting produces a larger quantity of metal, but the control of the final composition of the alloy is poor. The use of nickelin, in contrast, enables more exact control of the final content (Ryndina et al. 2008, 199).

The addition of arsenic to copper can significantly improve its strength by cold- and hot-working, its hardness, and its casting qualities (Patterson 1971, 308; Budd and Ottaway 1991, 138; Ottaway 1994, 130 ff.). Does the presence of nickel in the alloy have any function? Arsenical copper containing nickel is not superior in terms of hardness or malleability, as demonstrated by Ryndina et al. (2008, 203 ff.). However, the presence of nickel rises the temperature of recrystallisation. Alloys of copper with arsenic that do not contain nickel can be heated in the broader interval of 400–700 °C (Ryndina et al. 2008, 205 f.). In order to reach full recrystallisation of nickel-containing copper after hammering, however, the metalworker has to heat it in a very narrow range of 600–700 °C. Therefore, the presence of nickel is not just irrelevant for the qualities of the alloy, it is even detrimental. It seems thus that nickel was not an intended ingredient but a tolerated companion of arsenic. A nickel-containing arsenic mineral, as already mentioned, may have been preferred because, in contrast to other arsenic minerals, it facilitated the production of copper-arsenic alloys without loss of toxic arsenic trioxide.

Along with arsenical copper, north Caucasian metalworkers prepared several other copper-base alloys of secondary importance. A copper hammer-axe from Klady 31/5, for example, contained

30 per cent lead (Galibin 1991, 61). High lead content improves the flowing properties of copper and copper-lead alloys are well suited for filling complex forms, for example in lost-wax casting. On the negative side, copper-lead alloys have inferior qualities for cold-hammering and may split if hot-hammered (Galibin 1990, 181).

The axe from Klady was not work-hardened and possibly never intended for use, as suggested by its elaborate decoration. It demonstrates that the north Caucasus belonged to an area of early use of copper-lead alloys. The earliest evidence for this material has been reported from the Indus valley and dates to the fifth millennium BC (Mille et al. 2004, 267). Terekhova (1981, 316) reports that during the Namazga II period artefacts of copper with high lead content were common at sites in the Kopet Dag piedmont. The Parkhai II cemetery in southwest Turkmenistan, dating to the early and mid-fourth millennium BC, provided copper-based items with 2–4 per cent lead (Thornton 2009, 49). Furthermore, a crucible used for alloying arsenical copper and lead dating to the middle of the fourth millennium has been found at Tepe Hissar (Thornton and Rehren 2009).[100] In Mesopotamia and eastern Anatolia, in contrast, artefacts of copper-lead alloy appeared only in the later centuries of the fourth millennium BC.[101]

Among the objects from Klady, three artefacts found in Grave 31/5, a chisel, a pin and a dog figurine, were cast from an alloy of copper with a very high proportion of silver.[102] High-silver alloys of copper were prepared most probably for objects that were subsequently treated by surface depletion to imitate solid silver. Alloys of copper and silver were very rare in the Old World prior to the end of the fourth millennium BC. Beads of copper-silver alloy have been identified, for example, among the finds from the early-fourth-millennium BC cemetery of Soyuq Bulaq in the valley of Kura (Akhundov and Makhmudova 2008, 67 f.).[103] Slightly later are artefacts from mid-fourth-millennium sites in southwest Turkmenistan, for example the finds from graves in the Sumbar Valley, period SWT-VI (Thornton 2009, 50). Copper alloyed with silver was used only infrequently in Mesopotamia and eastern Anatolia at the very end of the fourth millennium BC.[104]

Finally, three objects from the kurgan of Maikop, two vessels and a metal rod, were manufactured from an alloy of silver with 10 per cent copper (Korenevskij 1988, 92). A low admixture of copper (7.5% in sterling silver) makes silver harder and more suitable for daily use. It remains, however, uncertain as to whether the alloys from Maikop were intentional, since native silver may contain a very high proportion of copper (Hodges 1964, 91).

Melting and Casting

North Caucasian metalworkers were experts in handling metal as a liquid. Casting and melting equipment, like all other kinds of metallurgical and metalworking tools and installations, has not been yet reported from the north Caucasus. However, traces on the surface of metal items give clues for the reconstruction of at least four casting techniques. First, Ryndina et al. (2008, 201) observed pieces of quartz on the surface of some copper artefacts, documenting casting in closed sand moulds. Shaft-hole axes, in contrast, were manufactured in two-part open clay moulds.[105] Disc pre-forms for hammering metal vessels and some small tools were presumably cast in one-part open moulds. Finally, several metal artefacts such as animal figurines, axes with relief decoration, "forks", and daggers with complex profiles were apparently produced in the lost-wax technique (Ryndina et al. 2008). The earliest evidence for the lost-wax technique so far comes from the chalcolithic levels at Mehrgarh in north Baluchistan and dates to the fifth millennium BC (Mille et al. 2004, 267). Lost-wax casting was widespread in central and southwest Asia during the late fourth millennium BC.[106]

Metalwork

The metalsmiths of the Maikop period practiced sophisticated techniques of handling solid metals. They produced various copper tools from massive pre-forms by hammering and annealing. By microscopic observations, Ryndina et al. reconstructed a manufacturing sequence that included casting, cycles of cold-hammering and annealing, and a final cold-hammering of the working edge (Ryndina et al. 2008, 208 f.). Depending on their chemical composition, the objects were annealed at 700–750 °C or at 600 °C.[107] Traces of hot-hammering at 650–750 °C, followed by cold-hammering of the working parts, were observed on very few objects (Ryndina et al. 2008, 210). Several types of stone tools found at sites of the Maikop period might have served as metalworking hammers, for example the hammers with a shafthole (Korenevskij 2004, Fig. 82) and possibly some of the "hammer stones" from the settlement of Chishkho (Hamon 2007, 195).

One further area in which north Caucasian metalworkers achieved impressing expertise was the plastic deformation of sheet metal and wire. The metal smiths of the Maikop period manufactured copper, silver and gold sheets and wires by hammering and annealing.[108] It has been suggested that traces on some tools from the cemetery at Klady might have originated from their use as anvils and hammers for beating precious metals into sheets (Korobkova and Charovskaja 1983, 91 f.).

The products of fine metalwork have not been subject to technological studies and we can only deduce about their manufacturing methods through comparisons with similar objects for which such studies are available. Judging from the shape of the artefacts, wire was cut and bent into rings and spirals, and metal sheets were cut, bent, and drilled for attachment to the surfaces of objects or clothing.[109] Tiny disc beads were cut from a thick sheet of gold or silver with a special tool by means of a hammer blow (see Korenevskij et al. 2008, 129), and cylindrical beads probably by cutting strips from a plaque, bending and joining. Such rings, appliqués and small metal beads were found at several sites in the area of the lower Kuban (see the section titled "Metal Inventory" in this chapter). Hollow beads may have been made in two halves either around a core or by stamping and subsequently seaming them together.[110] Moreover, faience and wooden cores were covered with metal leaf to produce more durable and solid ornaments. Silver beads with paste cores and gold beads with wooden cores have been recovered from Klady 31/5 (Rezepkin 2000, 63), but such advanced forms were absent among the finds from the Azov-Kuban steppe.[111]

The most sophisticated technique of handling metal as a solid material practiced in the north Caucasus was certainly the hammering of metal vessels. The metallographic investigation of a copper jar from Chishkho from the State Museum for Oriental Art showed a complex manufacturing technique which involved hammering the vessel body out of a cast copper disc and joining it to a separately cast high cylindrical neck (Ryndina 2005, 129, Fig. 7).

The techniques of secondary working practiced by the north Caucasian metalworkers involved the joining, surface finishing and decoration of cast and hammered objects. Evidence for the technique of cold-joining with rivets is scarce. Rivets were used for mending a large copper cauldron from Bamut, and for joining gold and silver lugs to vessels at Maikop (Munchaev 1975, Fig. 35, 1.10, Fig. 36, 1, Fig. 68). Cold-joining by hammering the contact surfaces is attested for a copper vessel from Chishkho (Ryndina 2005, 129), while hot-joining, most probably the technique of soldering, might have been used in the production of hollow beads with complex forms (see e.g. Korenevskij 2005a, Fig. 90, 13, 14). Soldering by means of basic tools and facilities is a very complex technique that demands extraordinary skill and control of fire (cf. Moorey 1985, 88).

Finally, techniques of copper “silvering” were practiced in the Maikop period. The silvery surface of some arsenical copper daggers, for example, might have been produced either unintentionally by inverse segregation, or deliberately, by placing the objects in wet sand mixed with table salt, as demonstrated experimentally by Ryndina (2005, 125). A different technique of intentional silvering was identified in the case of a copper dog figurine from Klady 31/5. The figurine was cast in lost wax from an alloy of copper and silver in approximately equal proportions. Copper in the surface layer was then intentionally corroded, apparently by treatment with acid (e.g. an organic acid like vinegar) and removed, creating the impression of a solid silver object (Ryndina 2005, 130).[112]

Metal Inventory

The objects recovered from Grave 1/1 at Chernyshev II – a flat axe, a tanged dagger and a chisel – are exemplary for the common types of large copper tools in graves of the Maikop period (Bianki and Dneprovskij 1988, Fig. 3, 1, 2, 6, 7). Flat axes and tanged daggers, such as the specimens from Chernyshev, were relatively frequent among the metal finds from the Azov-Kuban steppe (Fig. 4.11).[113] Chisels with complex cross sections, in contrast, have been reported only from Vozdvizhenskaja and Grave 2 at Psekup (Veselovskij 1902, Fig. 81; Lovpache 1985, Pl. IV).[114] Along with the tanged daggers, the coppersmiths of the north Caucasus produced a second type of this weapon with a broad and roughly triangular haft, found for example at Chernyshev II 10/2, Tenginskaja 1/6, Natukhaevskaja 1 Grave 4, Kurgan 3 at Rassvet and the settlement of Sereginskoe (Bianki and Dneprovskij 1988, Fig. 3, 5; Korenevskij 2008b, 11, Fig. 17, 3; Shishlov and Fedorenko 2006; Munchaev 1975, 266, Fig. 41, 4; Dneprovskij 1991, 6).[115] Some characteristic tools of the Maikop period were represented in the lower Kuban only with single specimens. A typical shafthole axe was recovered from Temrjuk 1/3 (Korenevskij 2004, 53), a "poker-butt" spearhead in Grave 2 and a hoe in Grave 150 at Psekup (Lovpache 1985, Pl. II, 1 and Pl. IV).[116] Finally, a distinctive copper hammer-axe was recovered from Grave 2 at Vozdvizhenskaja (Veselovskij 1902, Fig. 80).[117] Most of the described copper objects have comparisons on the Iranian plateau and in central Asia, dating to the early fourth millennium BC.

North Caucasian flat axes have straight sides and a specific short and wide body. Axes of this type appeared in the late fifth and early fourth millenniums BC in west Iran. Examples have been recovered from Susa I in Khuzestan, Giyan VC in Luristan, and Sialk III.5 near Kashan (Tallon 1987, 157–160, No. 371–422; Ghirshman 1938, 54, Pl. LXXXIV, S 183; Contenau and Ghirshman 1935, Pl. V, 1) (Fig. 4.13 later).[118] The tool spread to the south Caucasus in the early centuries of the fourth millennium BC. For instance, two specimens originate from Kurgan 1 at Telmankend (Narimanov and Dzhafarov Fig. 2, 6–7; Akhundov 2008).[119]

The second most popular implement, the tanged dagger, appeared at the turn of the fifth to the fourth millennium BC in central Asia and Iran. Among the earliest finds are daggers from Ilgynli-depe,

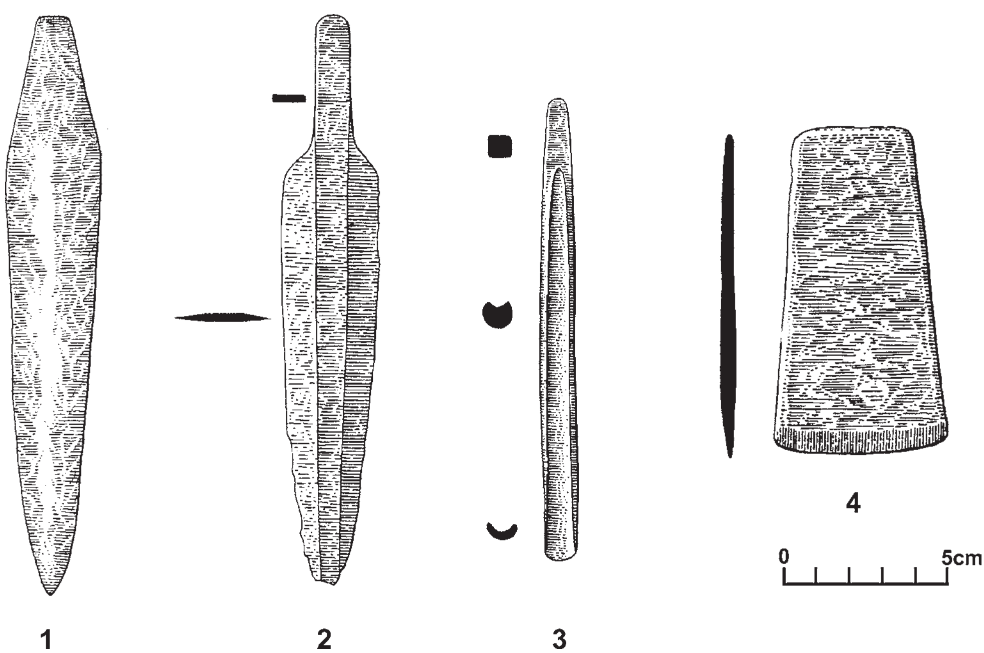

Figure 4.11 Copper tools from Sereginskoe (1), Krasnogvardejskoe (2.4) and Vozdvizhenskaja (3). After Munchaev (1994).

Hissar I, and Sialk III.2 and III.5 (Solovyova et al. 1994, Fig. 1; Schmidt 1937, PI. 16; Nezafati et al. 2008, 337; Malek Shahmirzadi 2004, Pl. 11; Ghirshman 1938, Pl. LXXXV) (Figs. 4.12 and 4.13).[120] The manufacturing of daggers with broad triangular hafts began during the same chronological horizon. A dagger of this type was recovered from Level 2 at Tall-i Bakun in Fars, dating to 4200–4000 BC (Fig. 4.12).[121] Slightly later date the daggers from Tepe Hissar II, Ghabristan II, and Kurgan 1/2006 at Soyuq Bulaq (Schmidt 1937, Pl. XXIX, H4677; Majidzadeh 1979, Fig. 4; Akhundov and Makhmudova 2008, Pl. 28, 5). Comparable artefacts have been reported from the Namazga II-Yalangach period site at Ilgynli-depe in the Kopet Dag piedmont (Masson 1992, Fig. 23.3; Solovyova et al. 1994, Fig. 1).[122]

Copper hoes and shaft-hole axes belong to the same cluster of early-fourth-millennium metal implements described previously. Hoes have been recovered, for example, at Tepe Sialk III.4 on the Iranian plateau, at Susa I in Khuzestan and at Eridu in the alluvial plain of lowland Mesopotamia (Ghirshman 1938, 54, Pl. XXIII, 8; Tallon 1987, 172 f., Nos. 528 and 529; Müller-Karpe 2002, 137, Fig. 1) (Fig. 4.13). At Mundigak III, 6 near Kandahar, a similar hoe was found together with a shaft-hole axe in a context dating to the late fourth millennium BC (Casal 1961, 249, Fig. 139, 9.10). The history of the latter tool, the shaft-hole axe, remains rather enigmatic; like the tanged dagger and the hoe, this implement may have originated in Iran in the late fifth millennium BC. The only two artefacts that can be related to this early period, both cast of nearly pure copper, unfortunately do not have secure stratigraphic contexts. One of them comes from an illicit excavation in Iraq, while the other was recovered at Susa (Müller-Karpe 2002, 138, Fig. 2; Tallon 1987, Fig. 49).[123] One fragment of a clay mould for casting shaft-hole axes is reported for the early-fourth-millennium site at Büyük Kesik in the valley of Kura (Müseyibli 2007, 142 f., Pl. XX, 16).[124] The absence of shaft-hole axes outside the Caucasus during the fourth millennium BC is striking. The only exceptions are probably the shaft-hole axes found in Level III, 6 at Mundigak in south Afghanistan (Fig. 4.13).

In summary, the north Caucasian metalsmiths manufactured a series of larger copper tools which were apparently of Iranian origin. None of the shapes described previously has been reported from fourth-millennium sites in the Syro-Anatolian region. The only tools that do not belong to the group of Iranian shapes are chisels and

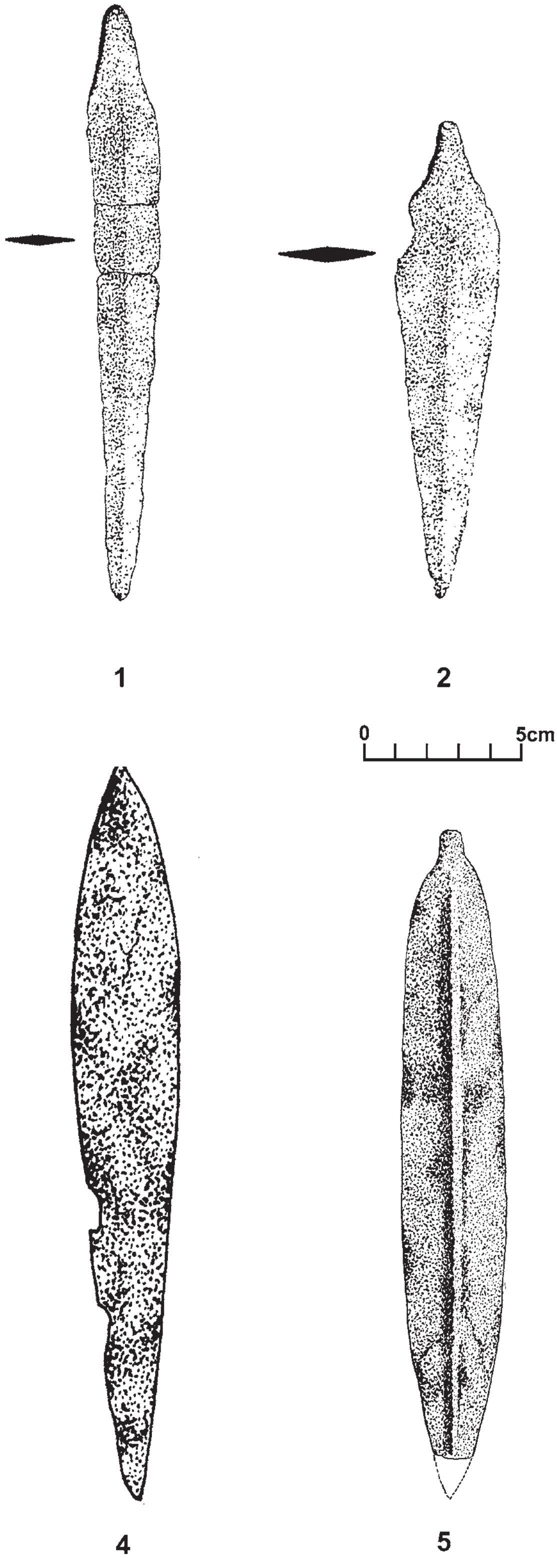

Figure 4.12 Copper daggers from Ghabristan (1–3), Tepe Hissar II (4–5) and Tall-i Bakun (6). After Majidzadeh (1979, Fig. 4), Schmidt (1937, Pl. XXIX, H4677 and H3012) and Alizadeh (2006, Fig. 70).

poker-butt spearheads. Chisels with complex cross section comparable to the finds from the valley of Kuban were recovered from the "Royal tomb" at Arslantepe VIB near Malatya, dating around 3000–2900 BC (Frangipane et al. 2001, Fig. 21, 7–9). The same grave also contained several spearheads of the so-called poker-butt type. Further finds of this spearhead type from secure fourth-millennium contexts have been reported from Arslantepe VIA and Kurgan 1 at Telmankend in Azerbaijan (Palmieri 1981, 109, Fig. 4; Akhundov 2007a, Pl. II, 9; Akhundov 2008, 19; Makhmudov et al. 1968, 20 f., Fig. 21, 8).

As has already been mentioned, several small objects of gold and silver have been found in graves in the area of the lower Kuban and

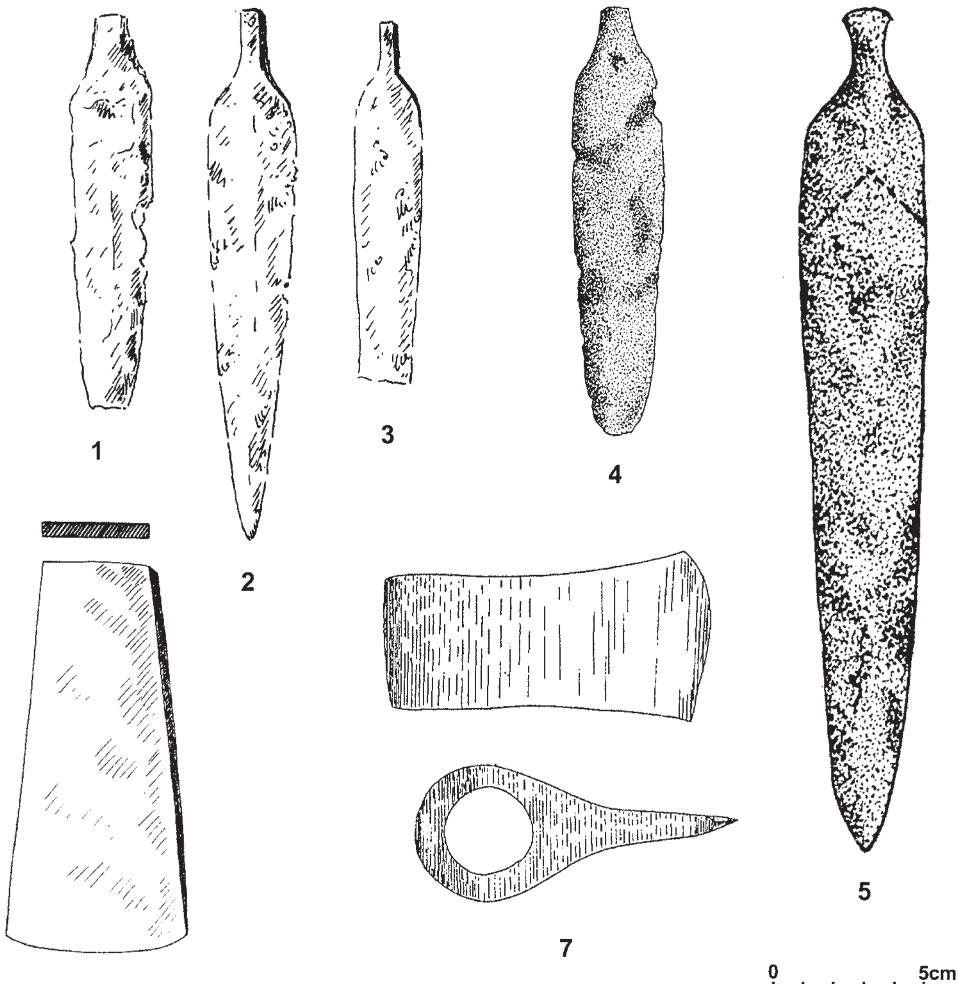

Figure 4.13 Copper artefacts from Tepe Sialk III.5 (1–3.6), Tepe Hissar I (4–5) and Mundigak III.6 (7). After Ghirshman (1938, Pl. XXXIV and LXXXV), Schmidt (1937, Pl. XVI, H3483 and H3408) and Casal (1961, Fig. 139).

the Azov steppe (Fig. 4.14). Ornaments of gold wire include gold rings from Staromyshastovskaja (Veselovskij 1900b), Natukhaevskaja 4/1 (Shishlov et al. 2009, Fig. 2, 3), Dneprovskaja 2/8 (Trifonov 1991, Fig. 6, 30), and Kurgan 3 at Rassvet (Munchaev 1975, 266, Korenevskij 2008b, Fig. 15, 3). Fragments of silver and gold sheet and small beads were found in Grave 5 at Uljap and at Staromyshastovskaja (Eskina 1996, Fig. 1, 2–7; Veselovskij 1890b). Moreover, the latter complex contained a small bovid figurine of solid silver and a gold pendant in the shape of a lion's head (Veselovskij 1900b, Fig. 159).

North Caucasian metalsmiths also produced several artefacts of local origin, including "cheek-pieces", "forks", beads and pins.[125] From all local forms, however, only the "cheek-pieces", copper rods bent into a circle, were found on the lower Kuban (Fig. 4.14, 1).[126] These bent rods may have served as copper ingots.

Large copper cauldrons, which are characteristic finds in the Caucasus piedmont, have not yet been reported from the Kuban steppe. However, a bronze disc from Temrjuk 1/3 (mentioned by Trifonov 1991, 107) provides indirect evidence for the manufacturing of copper vessels in this region. Moreover, a copper cup with a

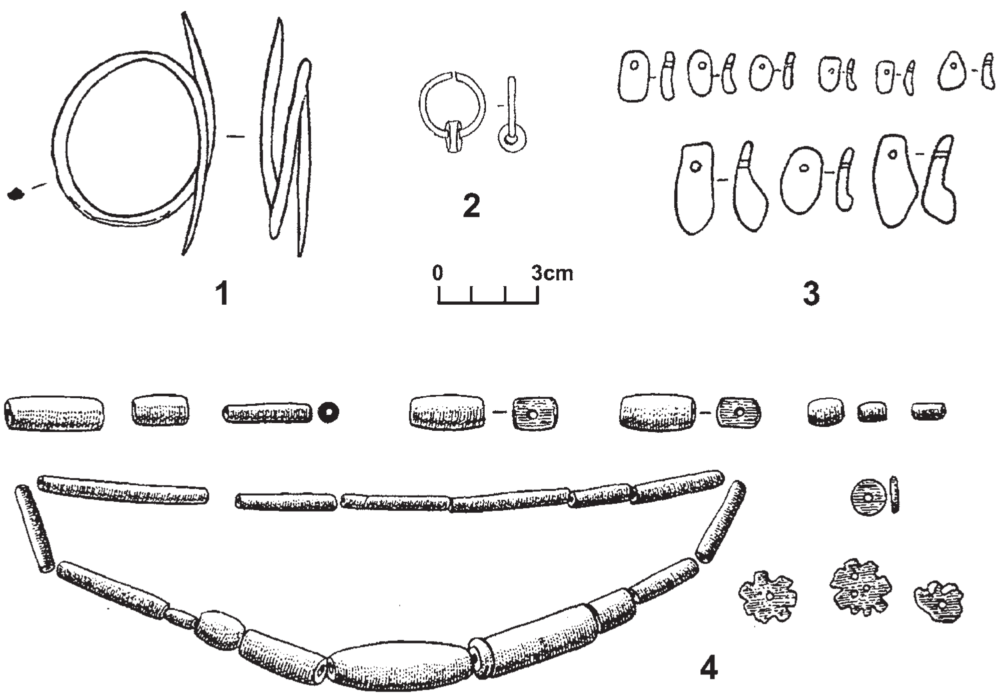

Figure 4.14 A metal rod from Taujkhabl (1) and decorations from Dneprovskaja 2/8 (2), Grave 12 at Novokorsunskaja (3) and the hoard of Staromyshastovskaja (4). 1 copper; 2 gold and carnelian; 3 stag teeth; 4 gold and stone. After Rezepkin (2000, Pl. 77, 2), Trifonov (1991, Fig. 6, 30) and Munchaev (1994, Pl. 48).

shape typical of the Maikop period has been found in the vicinity of Chishkho and a second chance find, a small silver jar containing a collection of beads, originates from the region of Staromyshastovskaja (Ryndina 2005, Fig. 7; Veselovskij 1900b).

Hammered metal vessels dating to the fourth millennium are very rare in southwest and central Asia. The earliest metal vessel appears to be a conical copper cup found in Sialk III.7 (Ghirshman 1938, 142, Pl. LXXXV, 1718). Small silver vessels have been reported from graves at Sé Girdan (Kurgan 3) in northwest Iran and at Sarazm II (Grave 4) in Tajikistan, both dating to the second half of the fourth millennium BC (Fig. 4.16, 1–2, later).[127] Metal containers were found not only in Iran and central Asia but also in Mesopotamia. For example, several late Uruk sites in the vicinity of Warka have yielded fragments of copper vessels (Adams and Niessen 1972, 205–206). Furthermore, a silver cup with a long spout was part of *Sammelfund* Pa XVI$_2$ from the Eanna area at Warka, dating to the Jemdet Nasr period (Heinrich 1936, 40, Pl. 29), while copper bowls and two ladles were found in graves of the pre-dynastic period at Ur (Woolley 1956, 30, Pl. 69).

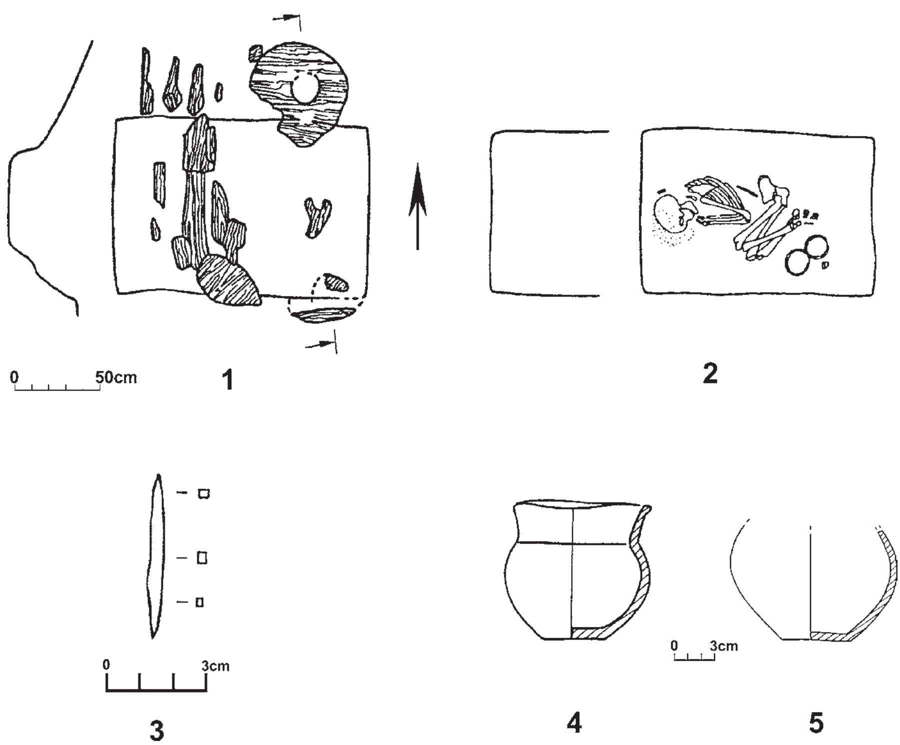

Figure 4.15 Grave 18 at Novokorsunskaja. 3 copper; 4.5 pottery. After Rezepkin (2000, Pl. 41).

ANIMAL-POWERED TRANSPORT

Four-wheeled wooden wagons are very common in graves dating to the third millennium BC in the Azov-Kuban steppe. Gej (2004, 186) assumes that a uniform heavy wooden vehicle, a wagon with two axles and tripartite disc wheels drawn by a pair of oxen, was used in the whole steppe region during this period. When buried together with a deceased person, the wagon was usually dismantled; the wheels were detached from the axles and laid on the sides of the wagon box (Izbitzer 1990; Gej 2004). Half of all third-millennium finds of wheeled vehicles between the Danube and Ural were uncovered in the region of Kuban. Trifonov (2004, note 2) interprets this striking concentration of early graves with wagons on Kuban as an indication of the spread of the wagon from this area into the steppe.[128]

The evidence for wheeled vehicles dating to the preceding Maikop period, in contrast, is very tenuous.[129] One grave associated with possible parts of a wagon was uncovered during the excavations of a large kurgan (Kurgan 2) at Novokorsunskaja, north of Krasnodar reservoir (Kondrashev and Rezepkin 1988; Rezepkin 2000, 74) (Fig. 4.15).[130] The kurgan contained twenty-eight graves from different periods, two of which date to the fifth millennium BC and four to the Maikop period. Grave 18 contained the ochre-coloured skeleton of a young individual, lying crouched on the right side with hands in front of the face. The pottery found in this grave (one whole vessel, one without a neck and a sherd of a third vessel) is comparable to finds from the cemetery of Novosvobodnaja.[131] The grave pit was filled with earth and covered with wooden beams. Remains of two wooden disc wheels lay over the wooden cover. One wheel was found in very bad condition, and the other had a preserved round hub and was about 60 cm in diameter.[132] Another possible find of wagon parts is reported from Pavlograd 4/18 near Krasnodar. The grave was excavated by Safronov in 1978, and the recovered wooden construction was interpreted by him as the remains of a wagon box, although it rather represented the wooden frame of the grave. According to Korenevskij, this find was not intact and its documentation was poor (see Korenevskij 2004, 99, note 3, and references).

It is important to stress that the sites with wagons pre-dating the third millennium BC were situated in the steppe, at considerable distance from the Maikop "heartland" in the foothills of the Greater Caucasus. However, both the wagon from Novokorsunskaja and a second find from Koldyri in the steppe on the lower Don (see Chapter 5) were uncovered in graves containing Maikop material, suggesting that animal traction and wheeled vehicles might have been introduced to the grasslands from the Caucasus piedmont.

The remains of two wooden wheels at Novokorsunskaja allow some suppositions about the type of vehicle to which they belonged. In size, they are similar to wheels of the Catacomb culture, for example those found in Ipatovskij kurgan (Belinskij and Kalmykov 2004, 206). The presence of a hub suggests a vehicle with rotating wheels and a fixed axle. The vehicle from which the wheels at Novokorsunskaja originate might have been a two-axle wagon like the roughly contemporary wagon from Koldyri on the Lower Don (see Chapter 5).[133] But it is also possible that the find from Novokorsunskaja was a two-wheeled cart. Clay models of two-wheeled carts with rotating wheels attest to the use of this type of vehicle in central Asia and the Indus valley in the late fourth millennium BC. At Altyn-depe in south Turkmenistan, such models occur in the second half of the fourth millennium (Namazga III period) and become more common in the early centuries of the third millennium (Kircho 2009). Cattle figurines with holes in the withers for attaching the yoke have been recovered at Kara-depe (Kircho 2009, 30). Comparable models appeared in the Indus valley around 3500–3300 BC, during the Ravi-Phase of the Indus culture at Harappa (Kenoyer 2004, 90 f., Fig. 2).[134]

SOCIAL VALUABLES AND FUNERAL FEASTS

Evidence about imagery and symbolism in the Maikop period is very scarce and is generally associated with the mortuary domain. Stone stelae with crude human shapes, essentially elongated stone slabs with "heads" hinted at the top, have been reported for several sites in the central Caucasus and the Stavropol plateau but not for the Azov-Kuban steppe.[135] The stelae usually were found in a secondary use as building material in grave chambers, for example at Kishpek and Nalchik (Chechenov 1970, 1984, 217). Some finds of stelae in the earth strata of the barrows suggest that the stones with human shapes might have been originally used as grave monuments on top of the kurgans (Chechenov 1984, 215). The actual functions and meanings of these artefacts are difficult to grasp, but they seem to be connected to the cemeteries and thus possibly to ancestral cults. Moreover, even if the communities of the Maikop period did not create clay human figurines or models of objects related to the domestic sphere, finds of clay figurines of horned animals were frequent at settlement sites (Rezepkin and Lyonnet 2007, Fig. 6, 1, Fig. 37, 1–2, Fig. 40, 1, Fig. 55, 1).

A social practice of ritualizing and celebrating violence is implied by the decorated weapons and the evidence for prestige hunting (stag teeth necklaces, depictions of large game, etc.). Although systematic osteological research has not been conducted on human skeletal material from the Maikop period, there are some indications that violence was actually part of everyday life. The grave assemblages suggest that the possession and carrying of weapons was a common practice. Many graves contained a dagger, sometimes in combination with a whetstone with a hole for suspension. The two objects were possibly worn together on the belt as part of the costume (see e.g. Trifonov 1991, Fig. 6, 34). A male individual with a lethal skull injury from Grave 28/1 at the cemetery of Klady (Rezepkin 2000, 57) shows that violence was not only intended but also employed.

Social valuables are objects that do not possess significant utilitarian functions but are valued for their aesthetic appeal, history of circulation, or their role in rituals and social transactions (Spielmann 2002). Such valuables were apparently common during the Maikop period. Among the most sumptuous items are the rare pigments and the ceremonial garments ornamented with shining gold and silver beads, rings, pendants, and exotic colourful stones. There are also some indications for the existence of controlled networks of exchange and restricted access to the products of special workshops. Imitations of highly prized items are frequent. Solid silver was "faked" by depletion silvering of objects cast from copper-silver alloys and by surface manipulation of arsenical copper (e.g. for vessels, figurines and weapons; see the section titled "Metalwork" in this chapter). Pendants of genuine stag teeth were mixed with imitations made of bone (at Novokorsunskaja 2/12 and Tsarskaja; Popova 1963, 42; Rezepkin 2000, 74). Shapes, shining surfaces and colours of metal vessels were imitated in clay.

The use of social valuables for the enhancement of personal status is usually a highly problematic practice, since it may instigate emulation and rapid "inflation" of diacritical significance (Dietler 2001, 86). The frequency of imitations in the assemblages of the Maikop period may hint at an increasing pressure to overcome the impermeability of a controlled exchange network (Earle 1997, 74).[136] Some of the sumptuous graves at Klady which contained large collections of objects of the same type arranged in heaps and layers in the tomb chamber (see note 33 in this chapter) may possibly document that an "inflation" of valuables was already under way.

Funerals played a central role in social life during the Maikop period, as indicated by the expenditure of labour in constructing the burial monuments and the remains of feasting around the graves.[137] The close connection between funeral and feasting observed in the north Caucasus is very common in the ethnographic record. Dietler (2001, 96) describes the funeral feasts of the Luo people in western Kenya as follows: "The largest feasts, and indeed the largest gatherings in the society outside of markets, take place at funerals. These events are held at the homestead of the deceased and are marked by the provision of large quantities of beer and beef, along with the standard *kuon* and other foods. They are accompanied by ritual dramaturgical practices such as parading of cattle, dancing, singing, speeches, and the recitation of praise songs that recount the accomplishments of both the deceased and the speakers. They often last for several days, during which a large group of lineage members, affines, and neighbours must be kept satisfied with copious amounts of food and drink. The prestige of the deceased and his/her family are thought to be reflected in the size of the gathering capable of being assembled and sustained at the funeral feast and the lavishness of the hospitality provided" (for further ethnographic references and a discussion see Hayden 2009).[138]

One of the central functions of feasting in mortuary contexts is thus the display of the affluence and prestige of the lineage. Feasting must have been even more important when large monumental constructions were to be erected. Given the ethnographically observed association of funerals and feasts, participation in the building of a monumental burial mound may have been motivated by the provision of large amounts of food and drink and opportunities for socializing rather than by obligations to the dead "patron" (as suggested by Korenevskij 2004, 87). Apart from its direct function for sustaining the participants, food has a central role in mortuary rituals as a signifier of wealth and as a grave offering. Numerous and larger vessels in the grave and in garbage pits around it might thus indicate larger quantities of displayed, consumed and sacrificed food and thus document the special status of the deceased.

An important aspect of funeral feasting during the Maikop period is the evidence for feasts involving rare objects and exceptional practices ("diacritical feasts", as defined by Dietler 2001). This change from quantity (e.g. of food and participants) to quality corresponds, according to Dietler (2001, 85), to the emergence of aspiring political elites. There is no direct evidence for the use of differentiated cuisine in the north Caucasus, though some "consumption paraphernalia" hint at special consumption practices. For example, large copper cauldrons were found in some of the lavish graves. The cauldron represents a vessel for cooking (probably for boiling sacrificial meat) for communal feasts, since its size is unsuited for preparing everyday family meals. Moreover, the manufacture of a copper cauldron requires valuable material and sophisticated skills. The copper cauldrons were often found together with one or a pair of copper "forks", which were possibly associated with them and with some common behaviour of preparing and consuming food.[139]

Drinking cups of precious metals were probably also used on important occasions and for special, most probably alcoholic, drinks (Fig. 4.19 later).[140] Which fermented drinks may have been consumed in these beautiful cups? The continental climate of the north Caucasus with its cold winters and long periods of frost makes winegrowing a labour-intensive and risky endeavour. Contemporary viticulture in the north Caucasus goes back to the seventeenth century and was established by Georgian migrants in the valley of Terek; the vineyards in the region of Krasnodar are not older than the nineteenth century (Kaloev 1981, 105 f.). If wine was produced in this area during the fourth millennium BC, it must have been an exceptionally expensive and rare commodity, a luxury for special occasions and not a staple.[141] Another possible alcoholic drink suitable for diacritical drinking feasts is mead ("honey wine"), a fermented mixture of honey, water and yeast with an alcoholic content similar to wine.[142] As stressed by Koch (2003, 135), honey has always been a very expensive commodity. Even after the development of large-scale beekeeping during the Middle Ages, honey and mead were luxuries to be consumed at the courts of kings. Bronze Age bog finds from Denmark consisting of large bronze buckets accompanied by gold cups, which are usually considered as table sets for serving and drinking mead (Koch 2003), offer an apt parallel to the find of a bronze bucket and silver cups in the kurgan of Maikop.

The majority of graves of the Maikop period were associated with barrows. During the fourth millennium BC most societies in the steppe between the Danube and the Caucasus built burial mounds. However, the construction of large, exaggerated and lavishly furnished monuments distinguished the Maikop communities from all their neighbours. Diacritical feasting and the erection of monumental constructions were possibly important mechanisms of sustaining political relationships under conditions of dispersed settlement and unstable social groups. Highly visible, monumental burial structures proclaim territorial rights, leadership and control. In a similar context, Earle (1997, 166) has made the point that a landscape marked by large burial mounds was no longer a natural world but a social space "owned and controlled by the chiefs".

LONG-DISTANCE TRADE

The lavishly furnished graves of the Maikop period contained series of foreign items obtained from distant regions. Among the exotic materials, pigments represent a frequently overlooked commodity suitable for long-distance exchange. Red pigments played a significant role in the burial customs of the Maikop period, but the chemical composition and provenance of the pigments recorded during excavation have not yet been studied systematically. Ochres are widely spread in nature but deposits of high-quality red ochres are rare. Moreover, not all red pigments recovered in graves were ochres. The floor of the grave from Maikop, for example, was covered with a layer of minium (lead tetroxide), a rather rare and poisonous pigment with a bright red colour (Veselovskij 1897 [1997]), while the red mineral from the excavations of Veselovskij at Tsarskaja proved to be cinnabar (mercury sulphide), supposedly from the valley of Donets (Alexandrovskaja et al. 2000).[143] The fabric covering the body of the deceased in Dolmen 2 of the same cemetery was sprinkled with yet another red-coloured pigment, an extremely rare mineral form of mercury oxide (montroydite), known for instance from a deposit in Turkmenistan (see the section titled "Weaving Crafts" in this chapter).[144]

Another exotic item is undoubtedly the carnelian cylinder seal from Krasnogvardejskoe, engraved with a depiction of a stag and a tree (Fig. 4.5).[145] A cylinder seal with a stag and a tree depicted in a remarkably similar manner has been found at Tepe Sialk IV (Fig. 4.16, 3). Moreover, two locally made cylinder seals of the Sialk IV period around 3000 BC were recovered from Area C at Arisman (Chegini et al. 2004, 213, 215). One of the seals has a standard geometrical pattern of the "Piedmont Jemdet Nasr style" and belongs to a type which was widely used in the Iranian highlands (see Pittman 1994). The second seal, however, was engraved in a local style with a depiction of a horned four-legged animal and a triangle. Further cylinder seals with animal depictions dating to the late fourth and early third millenniums have been uncovered at Sarazm III and IV in the valley of Zaravshan and at Shahr-i Sokhta I in Seistan (Isakov 1996, Fig. 10; Biscione 1984). The latter site also provided cylinder seals in Jemdet Nasr style. Another exquisite artefact that may originate from the south is the gold pendant from the hoard of Staromyshastovskaja (Veselovskij 1900b, Fig. 159). The artisan who created this realistic and accurate depiction of a lion head must have been intimately familiar with the animal, though lions apparently never inhabited the regions north of the main range of the Caucasus (see note 150).

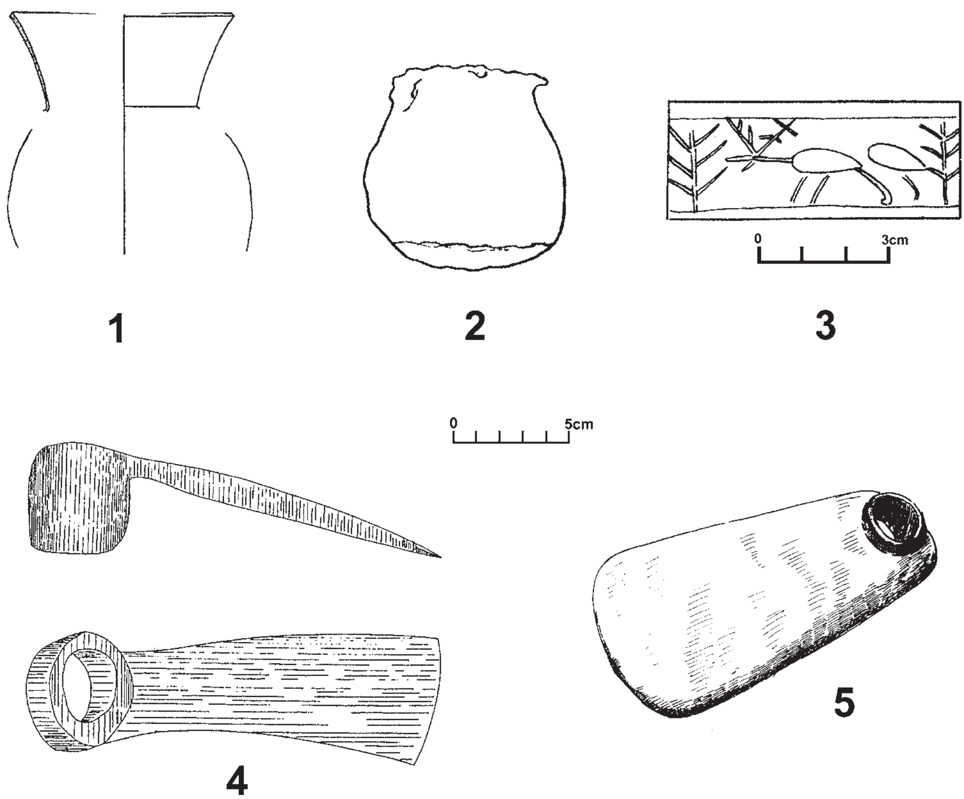

Figure 4.16 Artefacts from Tumulus III at Sé Girdan (1 – not to scale) (reproduced by permission of O. Muscarella from Muscarella 1969, Fig. 28, 1), Sarazm II (2) (after Isakov 1992, Fig. 4, 4), Sialk IV (3) (after Ghirshman 1938, Pls. XCIV S.54), Mundigak III.6 (4) (after Casal 1961, Fig. 139, 9), Sialk III.4 (5) (after Ghirshman 1938, Pls. LXXXIV B.251) and 1.2 silver; 3 stone, 4.5 copper.

Two further unusual items, namely the two silver cups with engraved depictions of animals recovered from the kurgan of Maikop, might have also reached the north Caucasus through long-distance exchange (Fig. 4.17). Admittedly, this site was situated at a considerable distance from the coastal plains. However, since the two vessels are central to the following discussion, they will be introduced briefly here. Uerpmann and Uerpmann (2010) have recently identified the animal species on one of the vessels as lion, aurochs, bear, wild horse, wild boar, (Asiatic) wild sheep, goitred gazelle, and at least two different bird species (Fig. 4.18, 1). The second vessel, which was not considered by Uerpmann and Uerpmann, was decorated with depictions of spotted wild felines (cheetahs or leopards), an aurochs and wild sheep (Fig. 4.18, 2). It is striking that all the figures represent wild animals.

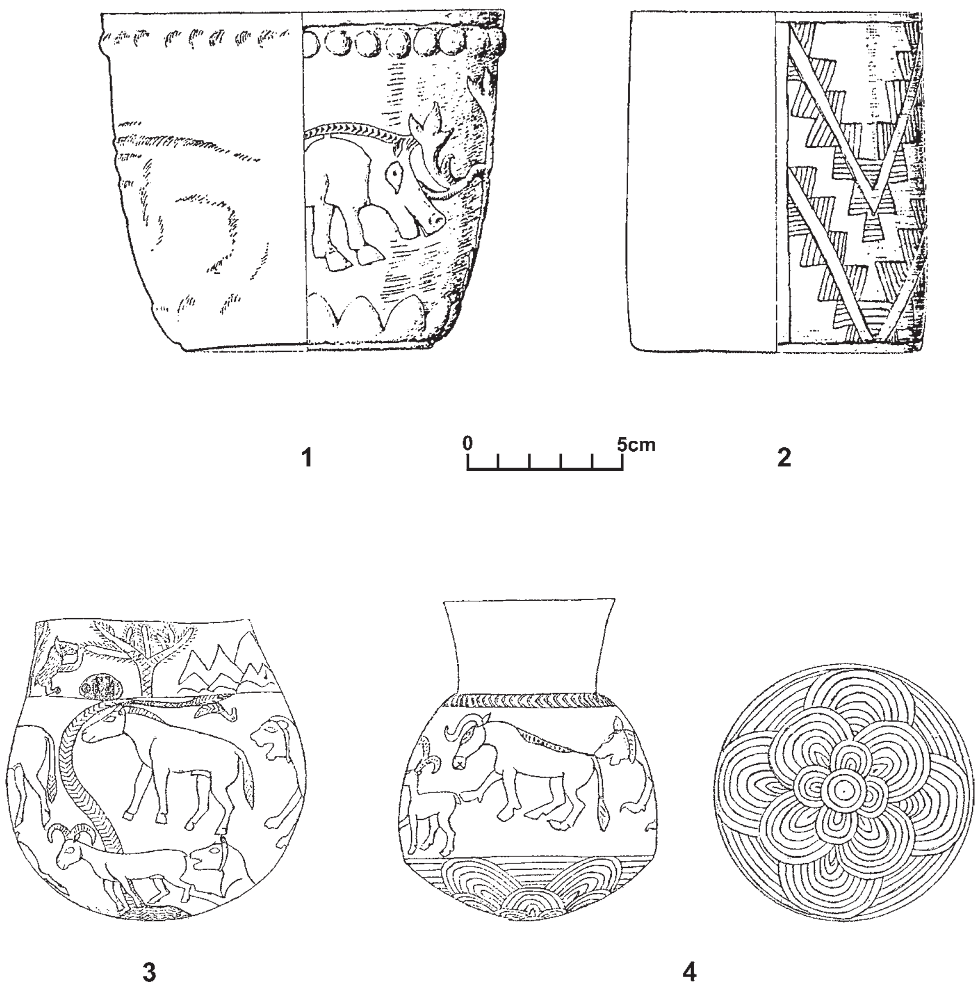

Figure 4.17 Decorated metal vessels from Fullol (1–2) (after Tosi and Wardak 1972, Figs. 2 and 4) and Maikop (3–4) (after Veselovskij 1900a, Figs. 26 and 27). 1 gold; 2.3.4 silver.

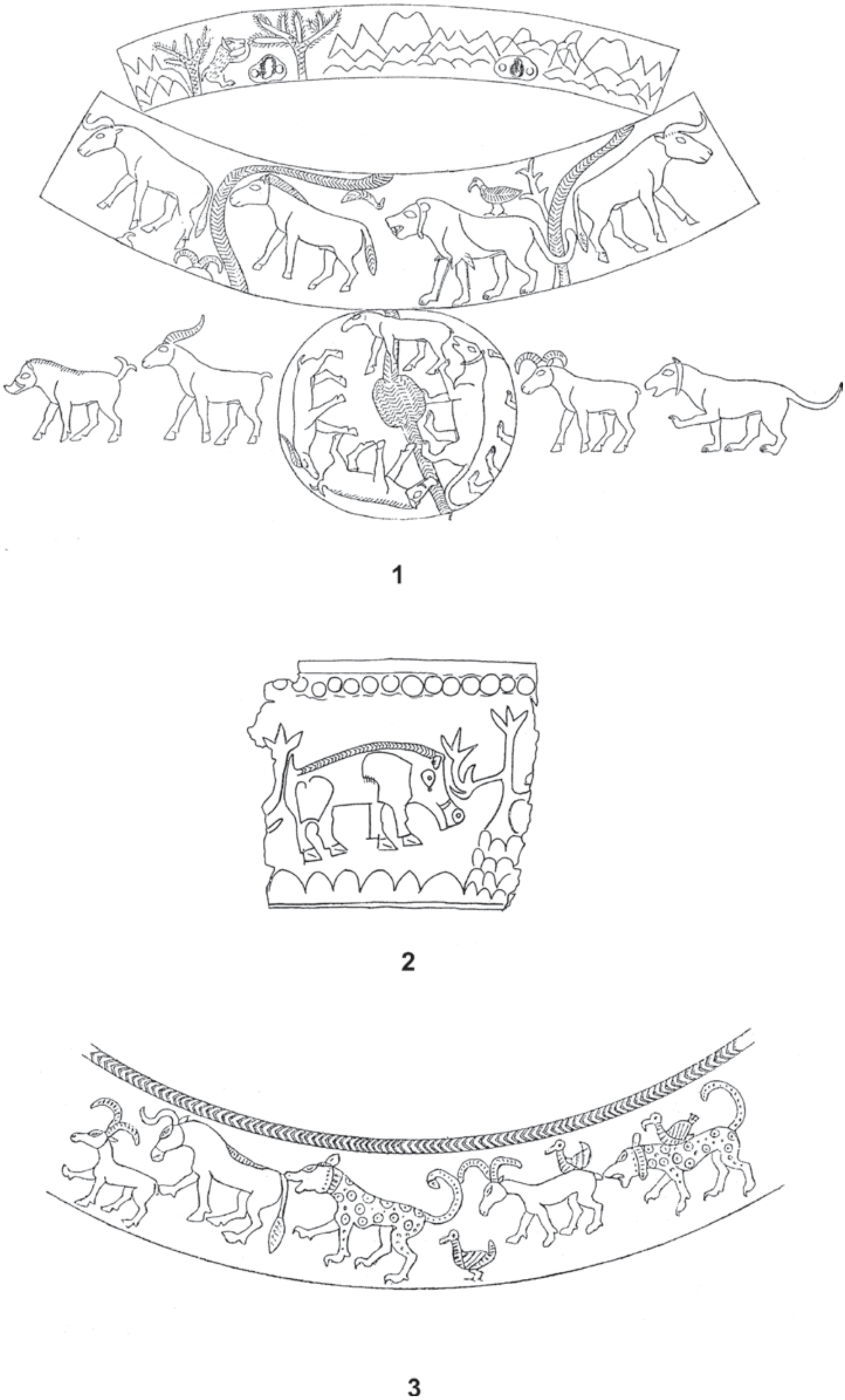

Figure 4.18 Figural decoration of the metal vessels from Maikop (1.3) (after Veselovskij 1900, Figs. 26 and 28) and Fullol (2) (after Tosi and Wardak 1972, Fig. 2). Not to scale.

Korenevskij (1988, 92) asserts that the two silver cups were products of local Maikop artisans.[146] However, the complete absence of metal vessels or other artefacts decorated in a similar way among the material of the Maikop period suggests instead that the unique silver cups were imports. Moreover, the animal species depicted on these vessels give some clues about their foreign origin.[147] Wild boar (*Sus scrofa*), aurochs (*Bos primigenius*) and brown bear (*Ursus arctos*) inhabit the north Caucasus and most other areas of southwest and central Asia (Uerpmann and Uerpmann 2010, 244 f.).[148] During the early prehistoric period, wild horses (*Equus caballus*) also lived on both sides of the Caucasus and in the highlands of Anatolia and northwest Iran.[149] Apart from these relatively common animals, however, the depictions include several animal species that have never been native to the north Caucasus – lion, Persian gazelle, wild sheep and cheetah.

Remains of Asiatic lions (*Panthera leo persica*) have not been yet reported from prehistoric sites in the north Caucasus and there is no evidence that lions inhabited this region in the past. Lions lived in historical times in Azerbaijan, on the Iranian plateau, in Mesopotamia and in the steppe regions of Anatolia (Uerpmann and Uerpmann 2010, 245).[150] Goitred (or Persian) gazelles (*Gazella subgutturosa*) are native to the flat desert and semi-desert environments of the southern Caucasus, Iran and central Asia (Uerpmann and Uerpmann 2010, 245).[151] Wild sheep, in contrast, inhabit mountainous regions with open vegetation. While wild sheep taxonomy remains controversial, researchers generally distinguish four Old World species of the genus *Ovis* according to their chromosome numbers: the European mouflon (*Ovis musimon*); the Asiatic mouflon (*Ovis orientalis*); and two species of sheep in mountainous inner Asia, the Urial sheep (*Ovis vignei*) and the Argali (*Ovis ammon*) (see Hiendleder et al. 2002, 893, with references).[152] None of these species of wild sheep inhabits the north Caucasus.[153] The wild sheep depicted on the silver cups of Maikop are most probably neither argali nor urial, two species whose male representatives have massive curving horns with nearly full turns. They seem most similar to some sub-species of the Asiatic mouflon, for example the Armenian wild sheep (*Ovis orientalis gmelini*), whose male representatives have long but only slightly curved horns. Today, Armenian sheep inhabit the highlands of Armenia, eastern Turkey and west Iran.

The last animal, a wild cat with a spotted coat, represents either a cheetah or a leopard. The Asiatic cheetah (*Acinonyx jubatus*) is a member of the cat family with very distinct physical features and behaviour. It has a slim body with a narrow waist and slender legs with visible, semi-retractable claws. Both features are recognizable on the depiction from Maikop, as accurately noted by Korenevskij (2001, 47). Asiatic cheetahs were encountered in the last century throughout the semi-deserts of the Middle East (including the south Caucasus) and central Asia and still live in isolated parts of Iran. Tamed cheetahs can be kept as dogs on the lane and trained as hunting companions.[154] However, cheetahs typically hunt for small prey like antelopes, hares and the young of some larger ungulate animals. The ungulates depicted on the silver cup from Maikop, aurochs and wild sheep, are rather large. Wild cattle and sheep, together with deer and wild goat, are the usual prey of leopards (*Panthera pardus L.*). In contrast to cheetahs, leopards were native to the north Caucasus as demonstrated by leopard bones found at at the fifth-millennium BC site of Meshoko in the piedmont area of the northwest Caucasus (Kasparov and Sablin 2004, 361 f., Fig. 3). Historical sources report that until the middle of the twentieth century leopards lived on both sides of the Caucasus; small populations of this large feline species still exist in the mountainous regions in southern central Asia, Iran, Armenia, Azerbaijan, Georgia and possibly Turkey (Khorozyan et al. 2006, Fig. 1). In summary, if the animals depicted on the silver cup are cheetahs, the region of origin of the cup can be restricted to the semi-deserts of the southwest Caspian and central Asia; leopards are not diagnostic for any particular mountainous region in the Middle East and the Caucasus.

In conclusion, the north Caucasus, a geographic region which has never been inhabited by lions, Asiatic gazelles and wild sheep, can be ruled out as the area in which the two silver cups from Maikop were designed and manufactured. The alluvial plains of Mesopotamia can be also excluded, since wild horses were unknown in this area and the horse arrived in Mesopotamia as a domestic animal in the late third millennium BC (see Uerpmann and Uerpmann 2010, 247). A restricted region including northwest Iran, Armenia, and Azerbaijan appears to be the only area to which *all* animals depicted on the silver cups from Maikop were native during the fourth millennium BC. This area represents the most likely place of origin of the silver vessel with depictions of lions, mouflon and gazelles. The cup with the spotted felines may have been manufactured in a broader region encompassing western Iran, the southeast Caucasus and, if the depicted species is a leopard, even in the highlands of east Anatolia. Since the depictions on the two cups differ considerably in style, they were most probably not made by the same artisan and thus not necessarily in the same geographic region.

The animal depictions from Maikop are unique indeed. However, they show resemblances to some of the objects from a hoard of five gold and seven silver vessels recovered during illicit excavations in 1966 near Fullol in north Afghanistan (Tosi and Wardak 1972) (Fig. 4.18). It is unlikely that this assemblage was a grave complex, since the artefacts vary considerably in both style and manufacture; rather, it was a compilation of items wih different origins and dates (Tosi and Wardak 1972, 12, 16). Some items are comparable in style and iconography to the art of the Early Dynastic period in Mesopotamia.[155] However, three of the vessels with geometric and animal decorations might date to the fourth millennium BC. The geometric motives on some of the gold vessels (Fig. 4.17, 2) closely resemble the Geoksyur-style painted pottery (e.g. the Kara-depe 1A style; Masson 1981, 93; Tosi and Wardak 1972, 12 f.). "Geoksyur" painted pottery is found in the second half of the fourth millennium BC in a huge area of central Asia, encompassing the valley of Zeravshan, the Kopet Dag piedmont, Kerman, Seistan and the Quetta valley (see the section titled "The Great Khorasan Road" in this chapter). Depictions of snakes on another vessel (Tosi and Wardak 1972, 16, Fig. 13) have comparisons on painted pottery sherds from Sialk III and Susa I (Ghirshman 1938, Pl. LXII, S/1963; Pl. LXXVII, B/1,2,5–7, D/2–5; Pl. LXXVIII, B/1; Mecquenem 1943, Pl. IV, 1–2). Finally, a gold cup with decoration of two boars on both sides of a tree and a lower border of triangular scales from Fullol shows some resemblance to the silver cup from Maikop. The geometrical style of the boar portrayal, its robust body with "massed muscles" (Tosi and Wardak 1972, 15) distantly reminds me of the Maikop hoofed animals (Fig. 4.18). Certainly, the stylistic comparison is not indisputable, and we have to keep in mind that the objects from Fullol are without proper context and thus very difficult to date.

Exotic ornamental stones found at several sites north of the Caucasus also point to connections with Iran and central Asia. Among the artefacts from the sumptuous grave at Maikop were sixty turquoise beads (Veselovskij 1900a, 4). Turquoise (hydrated aluminum phosphate) is a non-transparent sky-blue or blue-green mineral. Its largest and most important deposits are situated near

Nishapur in northern Iran (Weisgerber 2004; Tosi 1974).[156] Further sources of turquoise are found on the eastern fringes of the desert of Kyzylkum in the Bukantau, Tamdytau and Karamazar mountains in Uzbekistan and Tajikistan. Pits and quarries at Besapan in the Tamdytau mountains have been dated to the sixth millennium BC, while the workshops for turquoise beads at Beshbulak and Lyavlyakan provided evidence for a fourth-millennium exploitation of the deposits (Pruger 1989).

Rare finds of turquoise beads are reported from the PPNB period in west Iran at Ali Kosh and Jarmo (Schoop 1995, 68 f.).[157] Turquoise artefacts found wide distribution from the later sixth millennium BC onwards. They appeared in Turkmenistan, Seistan and Baluchistan; on the Iranian plateau; and in the south Caucasus at sites dating to the late sixth and especially the fifth millenniums BC: for example at Djeitun, Mehrgarh III, Tappeh Yahya VII, Tall-i Bakun, Tappeh Zagheh, Alikemek Tepesi, Chalagan Tepe and Kjul Tepe I (Pruger 1989; Samzun 1988, 126; Fazeli 2004, 195; Weisgerber 2004, 69; Kiguradze and Sagona 2003, 89; Narimanov 1987, 52, 116).[158] Turquoise beads are virtually unknown for Mesopotamian sites dating to the fifth and fourth millenniums BC. An exception was the beads recovered from graves of the periods XI and XA (early fourth millennium BC) at Tepe Gawra (Rothman 2002, Table A.10).

Probably the most attractive and highly valued ornamental stone of exotic origin, lapis lazuli, has been found at only three sites north of the main Caucasus range. Small beads of lapis lazuli are reported from Kudakhurt in Balkaria, Dolmen 1 at Novosvobodnaja and the hoard of Staromyshstovskaja (Korenevskij et al. 2008; Popova 1963, 41; Iessen 1950, 177; Piotrovskij 1998, Cat. Nr. 344). Lapis lazuli, a rock with a dark blue colour, consists of lazurite $(Na,Ca)_8[S_2(AlSiO_4)_6]$ mixed with other minerals. The most famous source of lapis in the Old World is the mines of Sar-i Sang located in the Kokcha Valley in the Afghan province of Badakshan (Weisgerber 2004). Sources of secondary importance are situated in the Chagai hills in Pakistani Baluchistan and in the Pamir mountains (Casanova 1992; Delmas and Casanova 1990).[159]

Unlike turquoise trade, there is very little evidence for the exchange of lapis lazuli before the fourth millennium BC (see Barthelemy de Saizieu and Casanova 1993, 17).[160] During the fourth millennium, however, a wide-flung network for supply with lapis lazuli ornaments emerged in central Asia. Industrial debris of lapis working was attested at Mehrgarh III in Baluchistan, a site dating to the later fifth and first half of the fourth millenniums BC, while beads of lapis lazuli were recovered at Mundigak I in Seistan (dating to the beginning of the fourth millennium BC) (Samzun 1988, 126; see also Tosi and Vidale 1990; Casal 1961, 240, No. 2; Barthelemy de Saizieu and Casanova 1993). Further north, lapis beads are reported from a child's grave at Kara-depe 2–3 in the Kopet Dag piedmont (late Namazga II period, second quarter-middle of the fourth millennium BC; Masson and Merpert 1982, 28) and from Tomb C at Geoksjur-depe 1 (Namazga III period, second half of the fourth millennium BC; Müller-Karpe 1984, 70). A fourth-millennium grave at Sarazm in the valley of Zaravshan contained more than 200 lazurite beads (Fig. 4.19).[161] In Iran, lapis artefacts dating to the fourth millennium BC were found at Mathoutabad in Halil Rud (Madjidzadeh et al. 2009), at Sialk III and IV (Ghirshman 1938, 56, 69–71, Pl. XXX), and Susa II (Mecquenem 1943, 15, Fig. 12, 7). Moreover, on the South Hill of Tepe Hissar were located workshops for lapis ornaments dating to the Hissar IIB period or the second half of the fourth millennium BC (Tosi and Vidale 1990, 98, with references; Dyson and Howard 1989, 48 f.). Although rare, lapis beads were also present in the south Caucasus, for example in the grave of Kurgan 1/2006 at Soyuq Bulaq (Akhundov and Makhmudova 2008, 70, Pl. 28, 6). In north Mesopotamia, beads and seals of lapis lazuli were found at Grai Resh, Tepe Gawra X, and Layer 16 in Area TW at Tell Brak, all dating to the early/middle fourth millennium (Matthews and Fazeli 2004, 71; Rothman 2002, Table A.10; Emberling and McDonald 2002).[162]

Beads of rock crystal and carnelian, two varieties of quartz, are often found in the north Caucasus, sometimes in combination with other ornamental stones and precious metals. Finds in the Azov-Kuban steppe include a bead of rock crystal at Timashevskaja; carnelian beads from Dneprovskaja 2/8, Grave 5 at Uljap and from the hoard of Staromyshastovskaja; and a carnelian cylinder seal from Krasnogvardejskoe (Trifonov 1991, 107, Fig. 6; Eskina 1996; Veselovskij 1900b; Nekhaev 1986). Rock crystal is pure transparent quartz, while carnelian is a variety of chalcedony coloured red by iron oxide. Unlike turquoise and lapis lazuli, these two minerals are very common and the exploitation of local deposits in the north Caucasus cannot be excluded.[163] However, since carnelian is often associated with lapis and turquoise in grave assemblages and in workshops, it seems probable that it represents yet another exotic

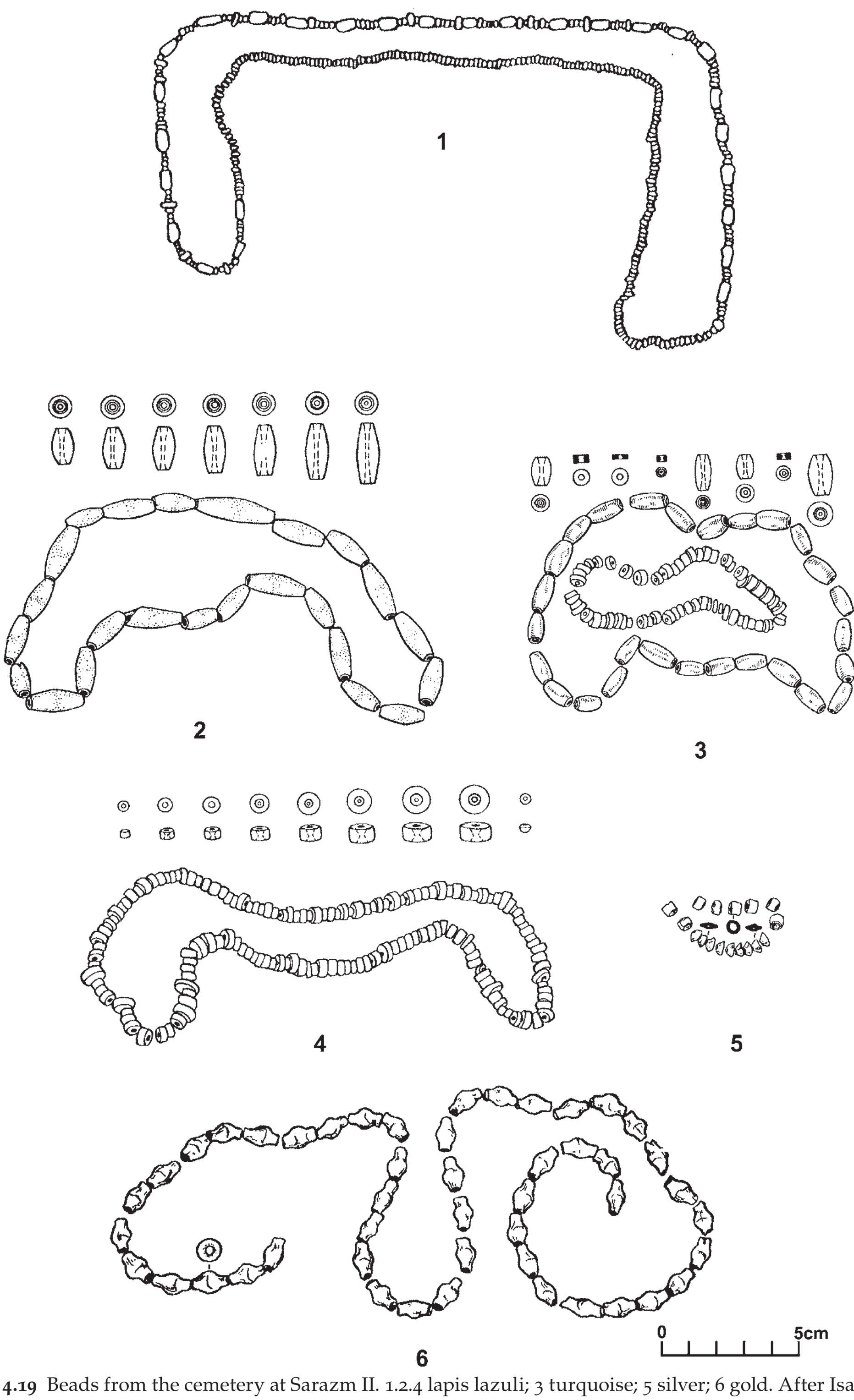

Figure 4.19 Beads from the cemetery at Sarazm II. 1.2.4 lapis lazuli; 3 turquoise; 5 silver; 6 gold. After Isakov (1992, Figs. 3 and Fig.4).

ornamental material traded across vast distances. Jewelry combining carnelian, rock crystal, gold, silver, lapis lazuli and turquoise was widely spread in central Asia, Iran and northern Mesopotamia in the fourth millennium BC.[164]

DECOUPLING THE SYRO-ANATOLIAN CONNECTION

The "Chaff-Faced Horizon" in Southwest Asia

The search for the roots of the peculiar material culture in the north Caucasus has a long tradition in archaeological research. The now prevailing, though rather speculative, interpretation regards Maikop as an offspring of the Near Eastern urban economies and trading networks in their formative phase during the Uruk period (Andreeva 1977, 1979; Trifonov 1987; Sherratt 1997a). Recently, archaeological fieldwork in the highlands of northeast Anatolia and the south Caucasus began to reveal actual finds of the first half of the fourth millennium with affinity to the early and mid-Uruk period of north Mesopotamia. Ceramic material closely similar to the "chaff-faced ware" of the Upper Euphrates and northern Syria was first identified by Marro (2005, 2007, 2008) during surveys in eastern Anatolia and Armenia, and later recovered during rescue excavations along the pipeline Baku-Ceyhan (Akhundov 2007a, 2007b; Müseyibli 2007).[165] According to Marro (2005, 2007), this specific pottery attests to an "Upper-Mesopotamian expansion" into the highlands and settling of foreign communities in the south Caucasus. A group of sites, including Berikldeebi, Kavtiskhevi, Leilatepe, Boyuk Kesik, Poylu, and Soyuq Bulaq, was characterized by pottery assemblages "mainly or totally in the North Mesopotamian tradition" (Marro 2007, 78).[166] Other sites, however, like Tekhut, Aratashen, Sioni, Tsopi, and the upper levels in Alikemektepesi, produced pottery of the local "late Sioni" type and only a few chaff-faced sherds. North Mesopotamian elements disappeared completely with the emergence of the Kura-Arax complex around 3500 BC (Marro 2005, 32).

The group of sites affiliated with the north Mesopotamian tradition encompassed both settlement mounds and "flat" settlements. Architectural remains comprised rectangular mudbrick houses with several rooms (at Leilatepe and Berikldeebi; Makharadze 2007; Narimanov et al. 2007, Figs. 1 and 2). A combination of rectangular and rounded structures of pisé and wattle-and-daub has been reported from Boyuk Kesik (Müseyibli 2007, 105). At Leilatepe and Boyuk Kesik, numerous domed ovens have been uncovered inside and between the houses (Narimanov et al. 2007, 16 f.). Intramural graves of infants and young children in vessels were common at these sites (Narimanov et al. 2007, 18 f., 28–30). Excavations at Telmankend, Soyuq Bulaq and Kavtiskhevi demonstrated that adults were buried in small mounds with diameters of 5–10 m encircled by a rubble stone revetment (Makharadze 2007; Makhmudov et al. 1968, 20 f.; Akhundov 2008, 19; Akhundov 2005; Akhundov and Makhmudova 2008, 28 f., 32–43, Pl. 4, Pl. 10). Some grave chambers were large and their walls were lined with stone slabs or mudbricks (Akhundov 2007b, Fig. 5).

Pottery assemblages at these sites consisted of two major wares. The fine chaff-tempered and well-fired ware with reddish colour and a slipped and polished surface closely resembles the "chaff-faced" pottery of the early and mid-Uruk and Amuq F periods in Greater Mesopotamia. Fine vessels have rounded bases and bear potter's marks and traces of wheel turning on the rim (Narimanov et al. 2007, 38, 52 f., Foto 7, Figs. 33–34). The coarse ware with mineral inclusions was fired at lower temperatures and shaped entirely by hand. This ware was much less numerous than the chaff-faced ceramics (e.g. in Leilatepe; Narimanov et al. 2007, 7, 37 ff.).

Common clay and stone artefacts include female figurines, clay stamp seals with animal motives, saddle querns and stone mortars, ceramic sickles, tools of regular flint and obsidian blades, and large flint sickle inserts with saw-tooth retouch (Narimanov et al. 2007, Fig. 6, 8, Fig. 8, Fig. 23, 1.3, Fig. 26; Akhundov 2007a, 62; Müseyibli 2007, Pl. 24, Pl. 28, Pl. 32, 12–15). Loom weights were absent but conical spindle whorls were very frequent among the finds (Narimanov et al. 2007, Fig. 18, 17–28). Peculiar large feline-headed "whetstone sceptres" have been recovered from the Kurgan 1/2006 at Soyuq Bulaq and Kurgan 1 at Telmankend (Akhundov 2007a, Table II, 10.11; Akhundov 2008, 19; Akhundov and Makhmudova 2008, 29, 36, Pl. 30, 8, Pl. 35, 3) (Fig. 4.23, 17). Graves at Soyuq Bulaq yielded small beads of carnelian, lapis lazuli, paste, and silver (Akhundov and Makhmudova 2008, 36, Pl. 28, 6–39). Large copper objects, like the two flat axes and the poker-butt spearhead from Kurgan 1 at Telmankend, are remarkably rare (Makhmudov et al. 1968, 20 f.; Akhundov 2008, 19; Narimanov and Dzhafarov 1990, Fig. 2, 5). A hearth with copper slags recovered in Structure 4 at Leilatepe and fragments of clay moulds at Boyuk Kesik attest to the practices of melting and casting (Narimanov et al. 2007, 12; Müseyibli 2007, 142 f.). The chemical compositions of finds from Leilatepe suggest the infrequent use of copper with arsenic content between 1 and 2 per cent (Aliev and Narimanov 2001, 135, Table XL), while the artefacts from Boyuk Kesik did not contain arsenic (Müseyibli 2007, 140–141).[167]

Several traits of pottery-making, metalwork and burial practices of the group of sites just described find close resemblances in the material culture of the Maikop period north of the Caucasus, including chaff-tempered, round-bottomed, wheel-shaped jars with potter's marks; arsenical copper; casting techniques; decoration with beads of gold, silver and exotic ornamental stones; burials in contracted positions on the right side in large tomb chambers; and tumuli with encircling stone revetments. However, the differences in lifestyle and social practices between the two regions are more pronounced than the shared features. On the one hand, stamp seals and the concept of sealing, infant burials in vessels in the houses, the tradition of village planning and village life, the construction of rectangular multi-room mudbrick buildings, and the use of female figurines, stone mortars, and domed ovens were unfamiliar to the northern communities. On the other hand, many metal forms (e.g. forks, cauldrons, "cheek-pieces"), the complex practices of polymetallic metalworking, the large kurgans with lavish graves, and the specific settlement tradition and architecture of the Maikop period are absent south of the main range of the Caucasus.

The movement of people across the mountains remains the most popular explanation for the appearance of foreign elements in the north Caucasus around the middle of the fourth millennium BC (e.g. Korenevskij 2008a, 79). Can we identify the incentives for migration of people and spread of ideas across a major geographic barrier like the main Caucasus range? Strikingly, the penetration of foreign practices and materials north of the Caucasus roughly coincides with the beginning of the "Uruk expansion", the expansion of the lowland networks of trade into the resource-rich highlands bordering Mesopotamia.[168] There is, however, hardly any evidence that these trading networks penetrated as far as the highlands of the Caucasus. Indeed, some communities in the southeast Caucasus manufactured chaff-faced pottery which clearly derives from the ceramic tradition of north Syria and the Upper Euphrates. Yet, it would be incorrect to interpret the "chaff-faced horizon" as the result of purposeful economic expansion: it seems that we are dealing with a huge ceramic province, encompassing Upper Mesopotamia and the Highlands north of the Oriental Taurus. The Kura-Arax horizon of black-red burnished pottery, possibly the most well-known example of a pottery style which spread over the whole region between the Mediterranean and Western Iran in the late fourth millennium, may well provide an appropriate comparison for the "chaff-faced *oikoumene*".[169] Carried by migrants and adopted among indigenous people, the spread of this pottery was a long-term process that can be described as a sequence of "ripples" rather than a wave of massive migration (Rothman 2005; Batiuk 2005; Batiuk and Rothman 2007). "Kura-Arax" communities penetrated to the north of the Greater Caucasus and settled in the central part of the foothill area (Rostunov 1989, 1996). The chaff-faced horizon, which covered nearly the same area, also extended at some point beyond the Caucasus range, most probably along the same routes through the passes of the central Caucasus. But if this specific pottery derives from the Syro-Anatolian sphere, did the other innovations also arrive from Greater Mesopotamia? In the concluding section of this chapter I argue that this was actually not the case; rather, the remarkable material culture of the north Caucasian societies was deeply rooted in a different, quite surprising tradition.

The Great Khorasan Road and the North Caucasus

Uruk Mesopotamia and the centralized societies in its Syro-Anatolian borderlands seem to have played hardly any role for the emergence and development of new technologies in the Caucasus around the middle of the fourth millennium BC. On the one hand, direct evidence for material exchange or participation in the Uruk-related trade networks is absent. More importantly, the foreign elements in the material culture of the Caucasus do not have correspondences on the Upper Euphrates and Tigris or in the alluvial plains of Mesopotamia, but rather in High Asia – on the Iranian plateau and in southern central Asia. The presence of sites with Syro-Anatolian chaff-faced pottery in the mountainous areas north of Zagros and Oriental Taurus, and their spread into the north Caucasus, may seem to contradict this view. However, northwest Iran and particularly the plain of Urmia constitute an integral part of the chaff-faced "pottery province" (Marro 2007, note 36, map 1). This region, and not east Anatolia proper, may well have served as the port of entry of this pottery into the Caucasus.

Let us consider the elements of central Asian origin in the material culture and technology of the north Caucasian societies. The most unambiguous evidence is provided by beads of colourful ornamental stones. Not only are the deposits of lapis lazuli, turquoise and possibly carnelian situated on the Iranian plateau and in the mountainous regions of central Asia, but the indirect supply with such materials via Upper Mesopotamia can be essentially ruled out. In the early fourth millennium lapis lazuli and turquoise were nearly absent in southwest Asia. Sites in Iran and central Asia, in contrast, provide ample evidence for the continuous exchange of these materials at least since the sixth millennium BC (see the section titled "Long-Distance Trade" in this chapter). An exotic fabric from Dolmen 2 at Klady, a rare red pigment from the same tomb, a unique bone pin with flat triangular head at Ust Dzheguta, and a carnelian cylinder seal with an engraved stag and tree motive from Krasnogvardejskoe all point to the Iranian plateau and its borderlands.[170] Furthermore, the silver vessels with animal depictions from the kurgan of Maikop portray animal species which are native in Azerbaijan and west Iran, and resemble in style another gold vessel with animal decoration found at Fullol in north Afghanistan. Along with these exotic commodities, exotic ideas and technological knowledge reached the communities of the Maikop period from the southeast. Most shapes of locally made copper tools, for example, derive clearly from Iranian and not from Syro-Anatolian prototypes. Other technological peculiarities of the north Caucasus, like lost-wax casting, beads of gold and silver sheet over faience core, copper-lead alloys, copper-silver alloys, arsenic-nickel copper, use of silver and gold, manufacturing of metal vessels, may well originate from the "Irano-Afghan" cultural sphere, and not from Greater Mesopotamia. All these innovations were part of the technological system in central Asia and Iran during the early fourth millennium BC.

In the early centuries of the fourth millennium BC, or the Namazga II period, the relationships between the societies of central Asia and Iran began to intensify. Rare ornamental stones, characteristic painted pottery motives and some specific artefacts (like the "handbag" stone weights) were appearing regularly at a series of sites in the valley of Zeravshan (Sarazm I), the Kopet Dag piedmont (Kara-depe 2–3), Seistan (Mundigak I) and

Baluchistan (Mehrgarh III).[171] The second half of the fourth millennium, or the Namazga III period, witnessed an unprecedented expansion of this network of exchange.[172] The so-called Geoksyur painted pottery designs were recovered at vastly distant sites like Sarazm and Zhukov in the Zeravshan valley (Masson 1992, 198; Kircho, personal communication, November 2010); Tal-i Iblis near Kerman on the Iranian plateau (Masson 1981, 81–85); Shahr-i Sokhta I and Mundigak III in the valley of Helmand in Seistan; and sites in the Quetta, Pishin and Kachi valleys in Baluchistan (Biscione 1984; Masson 1981, 89 f.; Casal 1961, 100; Jarrige 1981, 1988). Terracotta female figurines in central Asian (Geoksyur) style have been found in the lowest levels of Said-Qala in the Helmand valley and at pre-Harappan sites in the Indus valley (Masson 1981, 90 f.). The distribution of beads roughly matches the painted pottery: gold, silver, carnelian, turquoise and lapis lazuli beads have been reported for Sarazm II, Geoksjur-depe 1, Altyn-depe 9 and 10, Kara-depe 10, and Mundigak II-III (Isakov 1992; Müller-Karpe 1984, 62, 70, Fig. 24, 5.9–17, Fig. 27, 11; Masson and Berezkin 2005, 390, Fig. 3, 4; Masson 1981, 67; Casal 1961, 140 f.) (Figs. 4.19 and 4.20). Moreover, the presence of characteristic wheel-made pottery and seashell bracelets in Sarazm points to contacts with Baluchistan (Masson 1992). According to Kircho (2010), exchange was initiated by communities in the Kopet Dag piedmont, a region devoid of metal sources, with the aim of establishing a supply of copper from the deposits in the valley of Zeravshan.

The distribution of highly prized luxury goods, especially ornamental stones, hints at the westward extension of this central Asian network of the Namazga II-III period into north and west Iran. Moreover, "handbag" stone weights of the central Asian type were uncovered at Tepe Hissar IC and Sialk III (Ghirshman 1938, 55, 142, Pl. LXXXV, 223; Schmidt 1937, Pl. XVIII, 2095). We can only speculate about the exact mechanisms and routes of contact. In the medieval period a major road of long-distance trade, the Great Khorasan Road, connected the sources of lapis lazuli in Badakshan with western Iran. This natural east–west route led through a system of valleys between the Elburz mountain range to the north and the edge of the Dasht-i Kavir desert to the south, from Khorasan on the northeast fringe of the Iranian plateau to Tabriz near the southwest rims of the Caspian lowlands (Majidzadeh 1982, 59). Through the valley of Kura and the passes of the Central Caucasus, goods and ideas circulating along the Khorasan road may have been eventually channelled to the societies of the north Caucasus (Fig. 4.21).

The plain of Lake Urmia may indeed have been the frontier region where the societies of Iran and the Caucasus came into contact. Near the southeast corner of Lake Urmia, excavations took place in a cemetery of eleven tumuli at the site of Sé Girdan (Muscarella

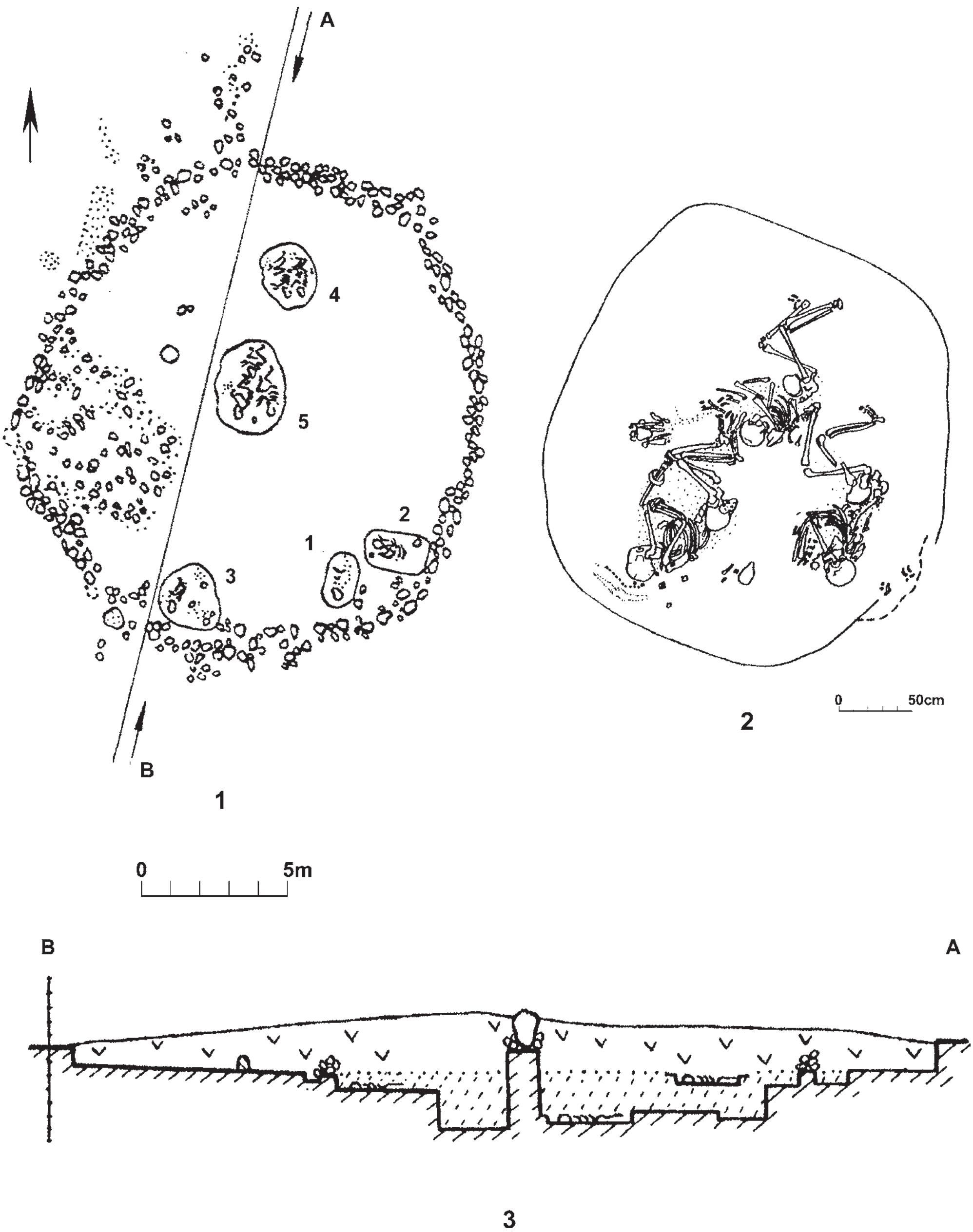

Figure 4.20 Plan of the cemetery area (1.3) and Grave 5 (2) at Sarazm II. After Isakov (1992, Fig. 1).

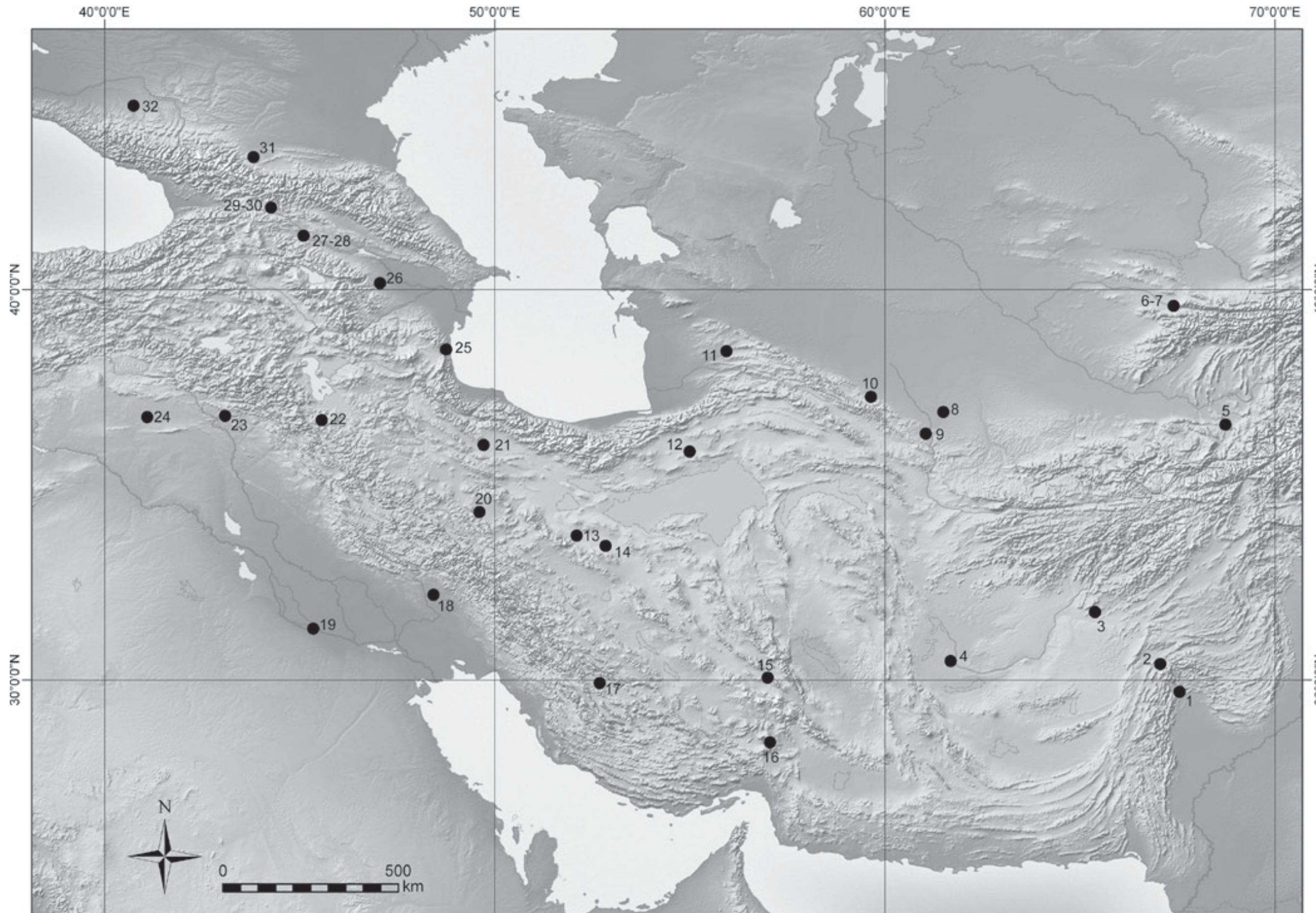

Figure 4.21 Map of sites in Central Asia and the southern Caucasus mentioned in the text: (1) Mehrgarh, (2) Quetta, (3) Mundigak, (4) Shahr-i Sokhta, (5) Fullol, (6) Sarazm, (7) Zhukov, (8) Geoksyur, (9) Altyn Depe, (10) Kara Depe, (11) Parkhai, (12) Tepe Hissar, (13) Tepe Sialk, (14) Arisman, (15) Tal-i Iblis, (16) Tepe Yahya, (17) Tall-i Bakun, (18) Susa, (19) Uruk-Warka, (20) Tepe Giyan, (21) Tepe Ghabristan, (22) Sé Girdan, (23) Tepe Gawra, (24) Tell Brak, (25) Telmankend, (26) Leilatepe, (27) Soyuq Bulaq, (28) Boyuk Kesik, (29) Berikldeebi, (30) Kavtiskhevi, (31) Kudakhurt, (32) Maikop.

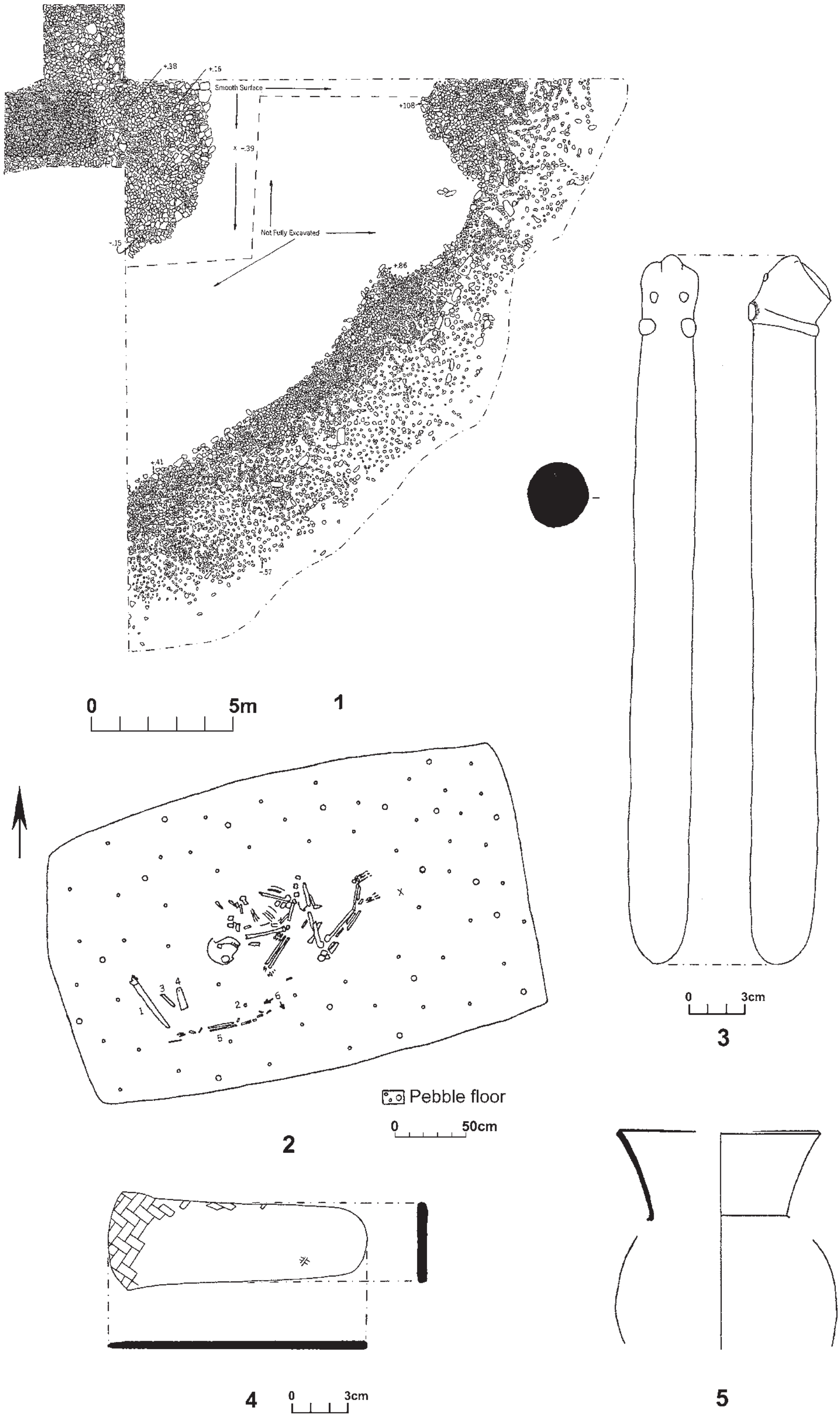

Figure 4.22 Tumulus III at Sé Girdan. 3 stone; 4 copper; 5 silver (5 not to scale). Reproduced with permission by O. Muscarella from Muscarella (1969).

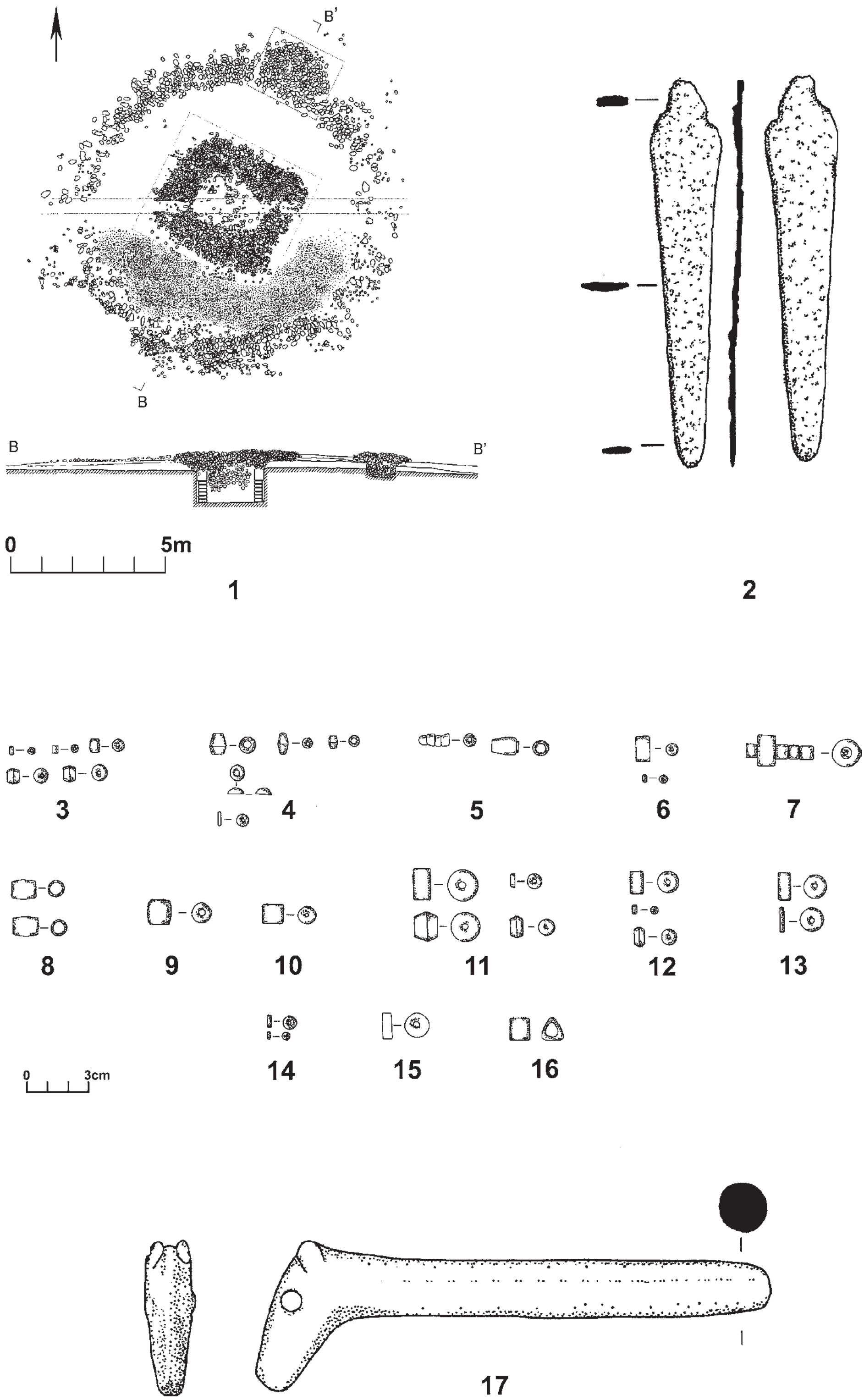

Figure 4.23 Kurgan 1/2006 at Soyuq Bulaq. 2 copper; 3.8 silver alloy; 4 gold; 5 silver foil with steatite core; 6.10 steatite; 7 silver and carnelian; 9 lapis lazuli; 11 carnelian; 12.13 brown-coloured stone; 14 stone; 15 shell; 16 bone; 17 stone. Reproduced with permission by B. Lyonnet from Lyonnet et al. (2011).

2003, 126 f.). The mounds were encircled with revetments of rubble stone and contained one grave each, often covered by a rock pile. The well-built stone chamber tombs with pebble floors and timber roofs contained ochre-coloured skeletons lying on their right side with legs drawn up and hands in front of the face. Grave goods included numerous tiny beads of faience, gold, and carnelian; a stone scepter with a feline-head shaped end; a silver cup; flat axes and pick axes of arsenical copper (Muscarella 1969, 1971) (Fig. 4.22). Muscarella (2003, 125) concurred that the tumuli represent "a north-western Iranian manifestation of the North Caucasian, Maikop, Early Bronze Age culture". However, animal-headed stone scepters and long axes of the type represented at Se Girdan are unknown from the north Caucasus, while pickaxes are extremely rare among the Maikop period finds.

Series of burial mounds in the southeast Caucasus provide better parallels for the tumuli in the plain of Lake Urmia. Tumulus 1 at Telmankend in the region of Astara, excavated 1965 by Makhmudov, encompassed a huge stone heap with a diameter of 14 m and a height of more than 2 m. In the centre of this construction was situated a small tomb chamber of stone, encircled with a ring of stone rubble with a diameter of 7 m. The tomb contained the skeleton of an adult individual accompanied by several artefacts: a clay wheel (possibly a spindle whorl), a stone animal-head scepter, a whetstone, and several objects of arsenical copper, that is two poker-butt spears, one flat axe (a second similar axe was recovered just outside the grave) and two awls, as well as several pottery sherds (Makhmudov et al. 1968, 21; Akhundov 2007a, Pl. II, 2008, 19). At Soyuq Bulaq near Aqstafa, excavations of some eighteen tumuli revealed several variants of the same burial custom – encircling revetments, tomb chambers walled with mudbrick and river boulders, wooden roofs, copper daggers and animal-headed scepters (Müseyibli 2005; Narimanov et al. 2007; Akhundov 2007b, 2008; Akhundov and Makhmudova 2008, 32–43) (Fig. 4.23). A partly damaged tumulus with similar features was excavated near Kavtiskhevi in central Georgia. It had an encircling revetment and covered a large square tomb chamber constructed above ground with stone blocks. The floor of the chamber was covered with a layer of pebbles. Unfortunately, the skeleton and accompanying artefacts were not preserved (Makharadze 2007, 2008). The similarities of these tumuli with the burial monuments of the north Caucasus are unmistakable: earth mounds with encircling rubble stone revetments, stone heaps over the tomb, tomb chambers (among them also very large square chambers with stone-laid walls and pebble floors), red pigment, and the postures of the body are common features in both regions.[173]

The geographic distribution of these characteristic tumuli seems to mark a route from northwest Iran along the valley of the Kura to the passes of the central Caucasus.[174] Researchers regard sites like Sé Girdan as unusual monuments, which emerged under influence of or even through the direct migration of north Caucasian communities (Muscarella 2003, 125; Korenevskij 2004, 76, note 2; Kohl 2007, 85).[175] This view appears feasible if such sites are viewed in isolation. Considered in the historical context outlined previously, however, the available evidence begins to reveal a new and meaningful pattern. Like several other innovations presented previously, the complex of peculiar funerary practices most probably spread from northwest Iran and the lowland areas of the southwest Caspian northwards along the valley of Kura, and reached the northern slopes of the Caucasus around the second quarter-middle of the fourth millennium BC. Thus, the funerary evidence adds further credibility to the hypothesis that the foreign elements in the north Caucasus originated from the Iranian plateau and its borderlands, and not from Greater Mesopotamia or the Anatolian highland, two regions which lie far outside the area of distribution of early tumuli.

5

The North Black Sea Grassland

INTRODUCTION

Archaeological Fieldwork

Intensive field investigations at sites of the Chalcolithic period in the region between southern Bug and the lower Don began in the 1950s. Among the earliest satisfactorily documented fieldwork at fourth-millennium sites in the coastal area were the kurgans at Zolotaja Balka and Osokorovka on the lower Dnepr (Rassamakin 2004a, 94 f.; Rybalova 1960) and at Novopilippovka on Molochnaja.[1] Moreover, during rescue excavations for the construction of a large reservoir near Kakhovka on the lower Dnepr, the Kakhovka Expedition of the Archaeological Institute at Kiev investigated the settlement at Mikhajlovka, a key site providing a stratigraphic sequence of three layers of the fourth and early third millenniums BC (Lagodovskaja et al. 1962; Korobkova and Shaposhnikova 2005).[2] In the delta of Don, the University and the Museum of Rostov excavated in the 1960s kurgans at Kojsug and a settlement at Liventsovka (Maksimenko 1973; Bratchenko 1969). The large-scale construction projects for irrigation of the steppe that took place during the 1970s and 1980s were accompanied by an enormous intensification of rescue excavations. During this "Golden Age of kurgan archaeology" (Gej 1999), thousands of Chalcolithic and Bronze Age graves were uncovered each year in the Ukraine, southern Russia and Moldau.

Following the completion of the Kakhovka Reservoir on the lower Dnepr, the focus of investigations shifted in the 1960–1970s to the North Crimea for the construction of the "North Crimean channel" from Dnepr to Kerch for irrigation of the dry areas of the northern peninsula. The Severo-Krymskaja expedition excavated fourth-millennium sites at Risovoe and Tankovoe in 1963, at Dolinka in 1965, and at Bogachevka and Tselinnoe in 1978 (Shchepinskij and Cherepanova 1969; Shchepinskij 1983 [2002]; Kolotukhin 2008, 128 f.; Gening and Korpusova 1989). In the 1970s and 1980s, the major operations in the region of the Kakhovka Reservoir moved into the interior. Two large expeditions, Krasnoznamenskaja under the direction of Evdokimov and Khersonskaja led by Kubyshev, worked simultaneously on both sides of the lower Dnepr. The former uncovered graves dating to the fourth millennium BC at Obloj in 1978, Pervomaevka in 1981, Skadovsk in 1984, and Malaja Aleksandrovka in 1989, while the latter investigated Chalcolithic kurgans at Pervokonstantinovka in 1971, Novovorontsovka in 1978, Volchanskoe in 1979–1980, Velikaja Aleksandrovka in 1981, and Dolinskoe in 1983 (the field excavations at these sites were conducted by Shilov and Dorofeev).[3] The intensity of field research has decreased significantly since the 1990s.[4] Virtually all kurgan graves uncovered during the last six decades of fieldwork remained unpublished (Fig. 5.1).[5]

Synopses

The first comprehensive overviews about the Chalcolithic period in the grasslands of the north Black Sea appeared in the early 1970s. In their monographic studies, Telegin (1973) and Danilenko (1974) arranged the archaeological evidence that had been accumulated in the two decades of field research after World War II in an explanatory framework. Both researchers departed from the simple assumption that the impressive array of material culture reflected in the archaeological record has developed along two independent lines. Sites in the coastal area of the plains belonged to one of these lines, the "Azov-Black Sea sequence", and were closely related to the farming cultures of the Caucasus and southeast Europe. The second sequence represented the interior country adjoining the forest-steppe; Telegin and Danilenko believed that this "Drevnejamnaja" or "Srednij Stog-Jamnaja" sequence either emerged from local neolithic traditions or was introduced by migrants from the Caspian region.[6]

As Rassamakin (2004a, 4) has pointed out, this oversimplified model soon appeared obsolete in the light of the overwhelming amount of new material from rescue excavations which became available during the "Golden Age". In the two decades following the synopses of Telegin and Danilenko, attempts to integrate the new data into the existing explanatory framework did not produce any clarity but only a puzzling array of classifications (see Rassamakin 2004a, 1–12). The break with the old concepts was instigated by a comprehensive and rigorous study of the whole body of material accumulated during the four decades of large-scale rescue excavations, which Rassamakin has pursued since the late 1980s.[7] Rassamakin rejected the traditional two-culture model and classified the graves according to their basic features, that is position of the skeleton, form of the grave and construction of the kurgan, into several "burial traditions". While his coherent and clear reassessment was aimed principally at a new chronological scheme, it also

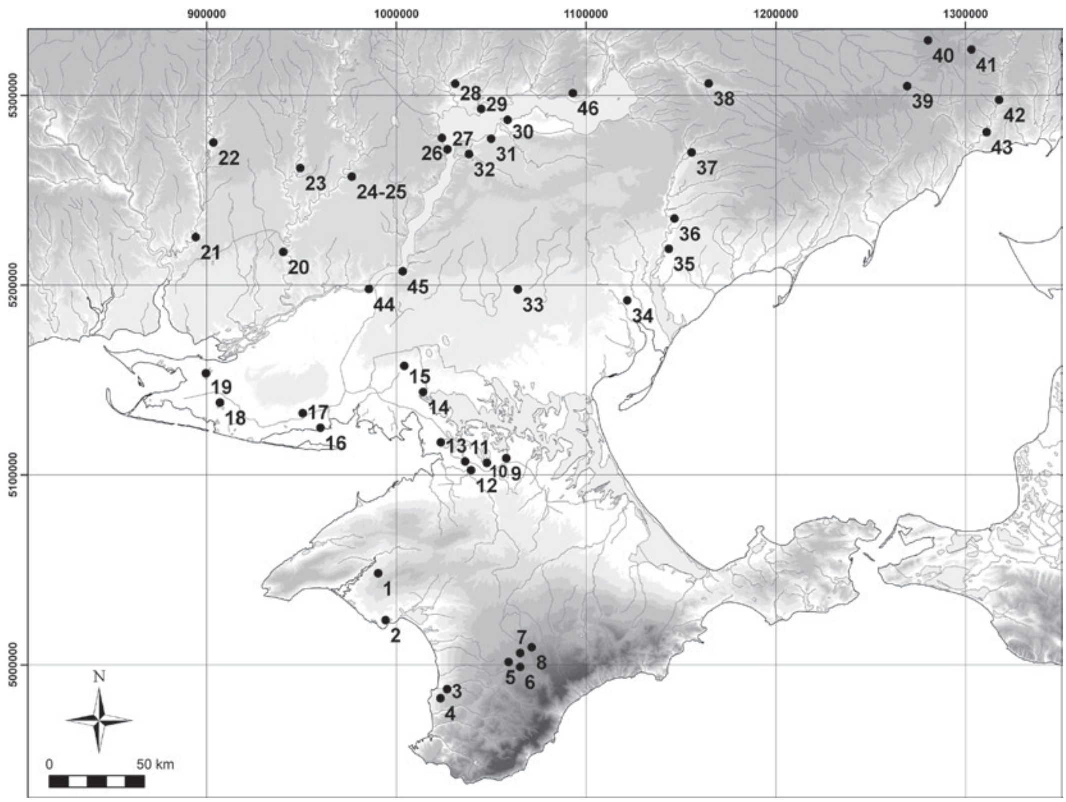

Figure 5.1 Principal sites in the north Black Sea region mentioned in Chapter 5: (1) Natashino, (2) Zaozernoe, (3) Vilino, (4) Uglovoe, (5) Chistenkoe, (6) Simferopol reservoir, (7) Beloe, (8) Donskoe, (9) Tselinnoe, (10) Bogachevka, (11) Dolinka, (12) Tankovoe, (13) Risovoe, (14) Pervokonstantinovka, (15) Dolinskoe, (16) Skadovsk, (17) Novoalexeevka, (18) Ozernoe, (19) Obloj, (20) Baratovka, (21) Kalinovka, (22) Stare Gorozhino, (23) Sokolovka, (24) Malaja Alexandrovka, (25) Velikaja Alexandrovka, (26) Zolotaja Balka, (27) Osokorovka, (28) Ordzhonikidze-Chkalovskaja, (29) Kapulovka, (30) Kamenka Dneprovskaja, (31) Mikhajlovka, (32) Pervomaevka, (33) Sergeevka, (34) Volchanskoe, (35) Konstantinovka, (36) Novopilippovka, (37) Vinogradnoe, (38) Orekhov-Tarasova mogila, (39) Vishnevatoe, (40) Novoandreevka, (41) Vasilevka, (42) Zamozhnoe, (43) Primorskoe, (44) Novaja Kakhovka, (45) Ljubimovka, (46) Verkhnaja Tarasovka.

provided the fundaments of a new conceptual framework for the Chalcolithic period in the steppe.

The figure of the horse-riding steppe nomad has played a central, though undeserved, role in the traditional models discussed previously. Danilenko believed that a combination of nomadic migrations, horseback riding, and the military use of horses was the prime mover in the steppe areas north of the Black Sea during the Chalcolithic period (Danilenko and Shmaglij 1972; Danilenko 1974, 92–106).[8] Yet, convincing archaeological or archaeozoological evidence for the presence of domesticated horses during the fourth millennium BC has not yet been reported (see the section in this chapter titled "Farming in the Grasslands" for a discussion). Moreover, several researchers have pointed out that the earliest clear archaeological evidence for nomadic pastoralism in the Eurasian steppe belt dates to the beginning of the first millennium BC (Khazanov 1994, 94; Kuzmina 1994, 1996, 1997, 2003; Otchir-Goriaeva 2002), while others are inclined to recognize its first manifestations in the third millennium (Shishlina and Hiebert 1998; Shishlina 2003). In any case, it would be erroneous to conclude that the nomadic way of life in the Eurasian steppes, as described in the ethnohistorical accounts, represents a universal adaptation to a dry grassland environment which also must have been valid for the prehistoric period. An interesting parallel to the situation in the Black Sea steppe offers the archaeology of the North American Plains (Wylie 1988). The prevailing opinion of the prehistoric inhabitants of the plains as hunters, the way of life encountered at the time of contact, was based on the presumption that it was impossible to sustain a simple sedentary agricultural economy in a dry steppe environment. However, archaeological research demonstrated eventually that the mobile hunting lifestyle of the indigenous groups was a recent development instigated by the introduction of horse riding, and was preceded by a long-standing agricultural tradition (Wylie 1988, 142).

Chronology

Settlement sites with secure stratifications are rare in the steppe between southern Bug and the lower Don, and the relative chronology of the region hinges principally on imports of painted pottery vessels from those of the forest-steppe Tripolie culture. Sherds of the Tripolie C1 period have been reported for the lower layer of Mikhajlovka (Korobkova and Shaposhnikova 2005, 56). The lower horizon of the middle layer provided three painted sherds of the late Tripolie (C2) Kasperovtsy group, possibly imported from the upper course of the southern Bug (Korobkova and Shaposhnikova 2005, 64). Furthermore, some of the Chalcolithic graves with contracted skeletons lying on the side contained vessels of the late Tripolie period (e.g. Ljubimovka 23/4, Ordzhonikidze "Zvadskie mogily" 9/10, Velikaja Alexandrovka 1/23, Vishnevatoe 2/4, Volchanskoe 1/ 21). The graves with contracted skeletons lying on the back or with extended skeletons can be dated only indirectly, since some of the objects that are typical for these graves have been recovered from late Tripolie sites. The so-called Serezlievka figurines, found in graves with extended skeletons, have been encountered in the second layer of the Late Tripolie settlement site at Sandraki on the southern Bug (Rassamakin 2004c). Moreover, a specific form of bone beads, which was characteristic for the graves with extended and flexed skeletons, was also present in a grave of the Usatovo group at Sadovoe (Maljukevich and Petrenko 1993).[9]

The radiocarbon chronology of the Chalcolithic period in the coastal plains is still in its beginnings. Radiocarbon measurements on animal bone samples from Structure 3 at Mikhajlovka I point at the first half of the fourth millennium BC (Kotova and Videiko 2004, Table 6). Three samples of animal bones and bone tools from Mikhajlovka II date this period to the last centuries of the fourth millennium (Kotova and Spitsyna 2003).[10] Furthermore, a charcoal sample from Level 7 of Razdorskoe on the lower Don, a settlement situated at some distance from the coastal region but comparable in its ceramic material to the coastal sites, provided a date with calibrated range of c. 3400–2900 BC (Kremenetski 1997, 40). The calibrated values of a radiocarbon-date obtained from human bones from Grave 6 in Orekhov-Tarasova mogila points at the same chronological range (Govedarica et al. 2006).

DISPERSED COMMUNITIES

The archaeological record of the coastal plains north of the Azov and Black Seas is strongly biased in favour of burial sites. If the distribution and locations of burial mounds are any indication, then the Chalcolithic population of the plains exploited and settled preferably riverine environments.[11] The Black Sea steppe is certainly not a desert, and small sedentary communities can find enough water even in its remotest parts (Otchir-Goriaeva 2002). Yet, with their lush vegetation and broad spectrum of resources, the floodplains of the larger rivers and the hollows appear oasis-like in comparison to the dry monotonous grassland of the watersheds, and it is thus not surprising that they attracted human settlement. Apparent exceptions to this rule are the burial mounds in the very dry and inhospitable area around the salt lakes of the eastern Crimea. Yet, historical accounts suggest that the shallow lakes salinized and the bay was silted only after the second century BC. In the fourth millennium BC, the kurgans were possibly situated near the shores of deep brackish estuaries and large freshwater lakes, an environment rich in water, animal grazing, migratory birds, fish, and herds of large wild ungulates (Shchepinskij and Cherepanova 1969, 16 f.; Shchepinskij 1983, 6 f.).

The excavated settlement sites are situated on terraces and hills near the riverbanks and characterized by thin cultural strata and insignificant traces of construction. The site of Mikhajlovka lay on a low hill near the high right bank of the river Podpolnaja, a left tributary of the lower Dnepr. It controlled the widest part of the floodplain and had access to the floodplain forests and meadows. The excavations at Mikhajlovka uncovered the whole area of the settlement. In the second half of the fourth millennium (Mikhajlovka II) it measured c. 0.4 ha (Korobkova and Shaposhnikova 2005). Two other sites from the same period have been excavated near the rims of river terraces at Razdolnoe on Kalmius and at Liventsovka I on the right bank of the lower Don (Shaposhnikova 1970, Bratchenko 1969). The settlement of Razdolnoe encompassed c. 0.75 ha. Liventsovka I and Razdolnoe did not provide any evidence of domestic structures, while the excavations at Mikhajlovka revealed only unsubstantial architectural remains.[12] All features at Mikhajlovka were situated in a narrow strip along the rim of the hillslope facing the riverbank (Fig. 5.2). The floors of the houses at Mikhajlovka I and the lower phase of Mikhajlovka II lay c. 0.40 m below the ground surface, while the upper phase of Mikhajlovka II comprised only aboveground constructions (Korobkova and Shaposhnikova 2005, 30 f.).

The lowest architectural phase at Mikhajlovka was uncovered over the entire area of the village. It comprised only four structures – one large house (House 1) in the southern part of the excavation area and a group of one large and two smaller houses 50 m north of it. Between the two groups lay a scatter of hearths and ashy areas. The dwellings were elongated oval wattle-and-daub structures with

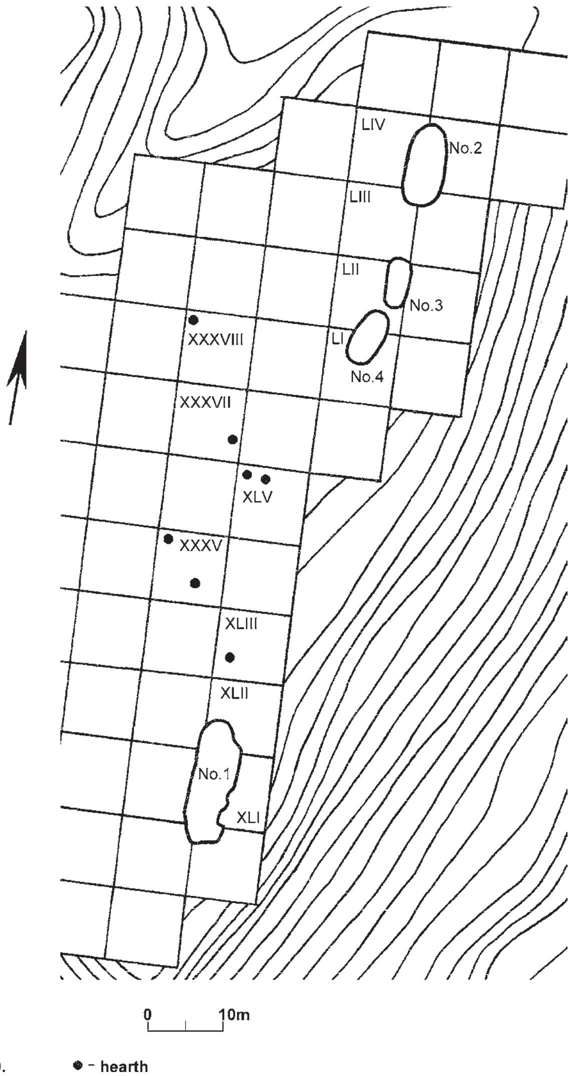

Figure 5.2 Plan of the habitation area at Mikhajlovka I. After Korobkova and Shaposhnikova (2005, Fig. 7).

sunken floors and floor areas of c. 60 m². The house depressions were filled with burned material, probably from the walls and roof. In the centre of House 1 was situated a round clay-plastered stone platform that was 1 m in diameter which served as a hearth. A smaller hearth with a similar construction was recovered in House 2 (Korobkova and Shaposhnikova 2005, 30–34).

The settlement of Mikhajlovka II consisted of a cluster of five contemporary buildings and one further structure situated c. 50 m northwards. The dwellings had oval ground plans and floor areas of c. 50–70 m² (Fig. 5.3). Their floors showed several layers of re-plastering. In the middle of each dwelling was situated a round hearth platform of beaten clay with a diameter of 0.5 m. Furthermore, grinding installations and domed ovens were uncovered in Houses 1 and 2. Some of the dwellings contained square clay podia. The floors were buried under the collapsed burned destructions of the clay walls and roof. At least two of the domestic structures (Houses 1 and 7) were rebuilt once. An outdoor cooking area with a group of hearths, used possibly for communal preparation of food, was investigated in the vicinity of the house cluster (Korobkova and Shaposhnikova 2005, 34–38, Fig. 10). Moreover, post-excavation analysis revealed the presence of at least two flint knapping areas with large accumulations of flakes, blades, and cores (573 finds next to House 1 and a smaller concentration near House 3). A collection of eleven stone artefacts with traces of use as metalworking tools, observed next to the central group of houses, provides evidence for metalworking at Mikhajlovka II (Korobkova and Shaposhnikova 2005, 271–275).

In summary, the evidence from the settlements suggests that the Chalcolithic population of the steppe lived in small and dispersed

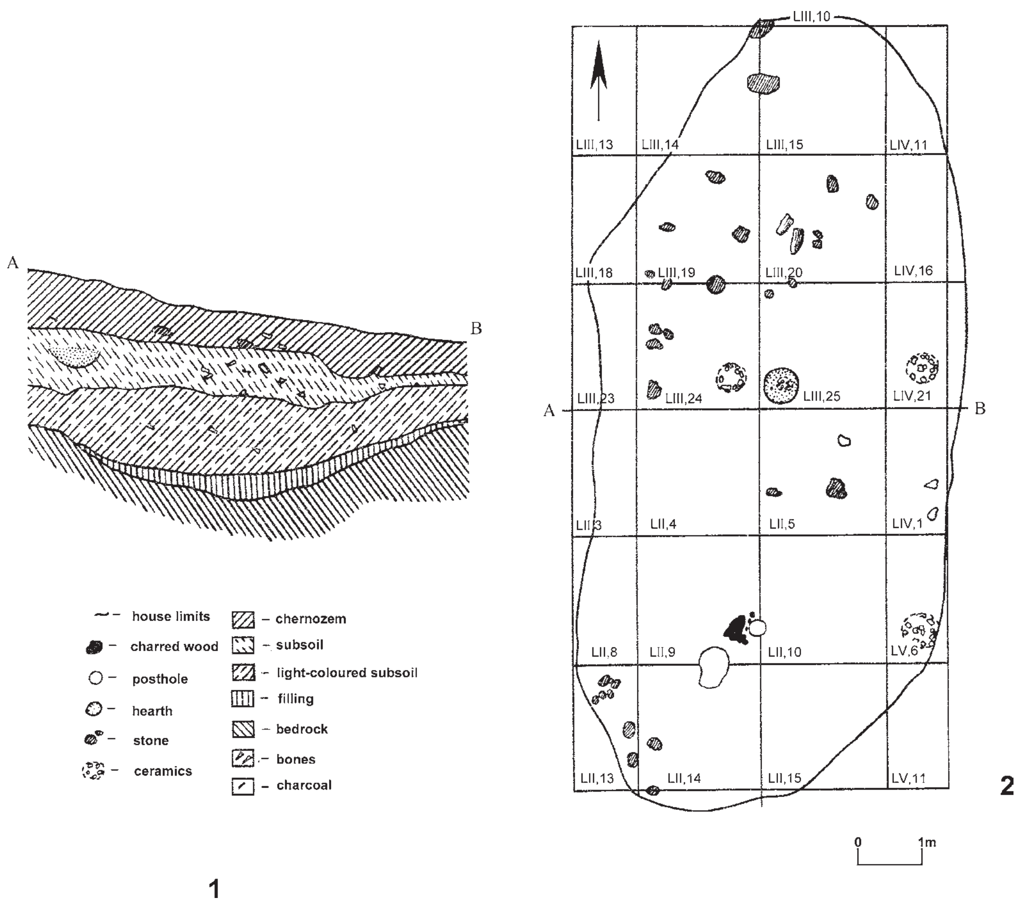

Figure 5.3 House 2 at Mikhajlovka I. After Korobkova and Shaposhnikova (2005, Fig. 9).

communities. Very small, short-lived settlements of several households situated on riverbanks with access to the floodplain may have been the rule. The buildings had light constructions of tree branches, clay and reeds, though they certainly served as permanent and comfortable dwellings with a hearth, oven, grinding stones, and clay platforms. Some activities, e.g. cooking and processing of raw materials, took place between the dwellings. Considering the ethnographic evidence, Gilman (1987, 548) argued that the presence of "pit houses" is a very strong indication of occupation on a seasonal basis. Thus, it cannot be excluded that sites like Mikhajlovka functioned as cold-season habitations in a bi-seasonal settlement system.

Inhumation in contracted and extended positions in a simple pit prevailed during the fourth millennium BC in the northern Black Sea (Figs. 5.4 and 5.5). Less frequently, the deceased were placed in stone or timber cists constructed above ground (Fig. 5.7, later).[13] Specific types of skeletal positions apparently predominated in the separate geographic areas (Rassamakin 2004a, Figs. 3–11). The graves in the region of Ingul, Ingulets and the lower Dnepr are the least uniform group, with contracted skeletons both on the back (Zolotaja Balka, Malaja Alexandrovka 1/8) (Fig. 5.4) and on the left side (Kalinovka 4/11, Ljubimovka 23/4). Extended inhumations were clustered on the shores of Kakhovka Reservoir (Novovorontsovka 1/8, Osokorovka, Pervomaevka, Kamenka Dneprovskaja 14/2) (Fig. 5.5). The graves near the shores of Karkinitskij bay and in the northern Crimea

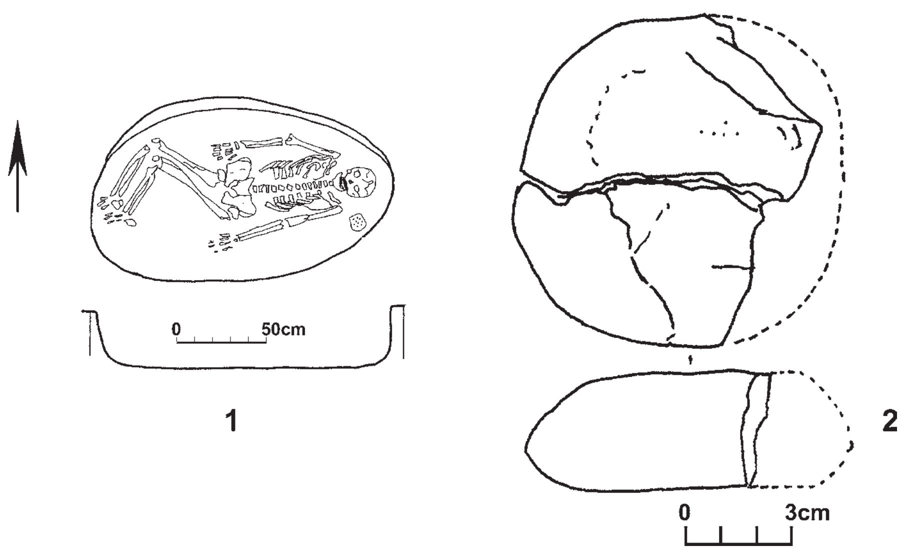

Figure 5.4 Grave 1/8 at Malaja Alexandrovka I. 2 ochre. Reproduced with permission by J. Rassamakin from Rassamakin (2004b, Pl. 315).

contained typical flexed skeletons lying on the left side (Skadovsk 1/6, Dolinskoe 1/32, Tselinnoe 6/12), while extended inhumations predominated along the Azov coast and in the valleys of Molochnaja and Kalmius (e.g. at Jurevka 6/7, Novopilippovka, Vinogradnoe, Novoandreevka 4/2, Vishnevatoe 2/2). Graves on the lower Don contained flexed skeletons lying on the back (Mukhin II) and extended skeletons (Kojsug Group II, Kurgan 7). Finally, graves in which the deceased were placed in a contracted position on their right side were dispersed over the whole coastal region (Fig. 5.6).

The body of the deceased was usually coloured with ochre, with the quantity of pigment varying from sparse traces to layers

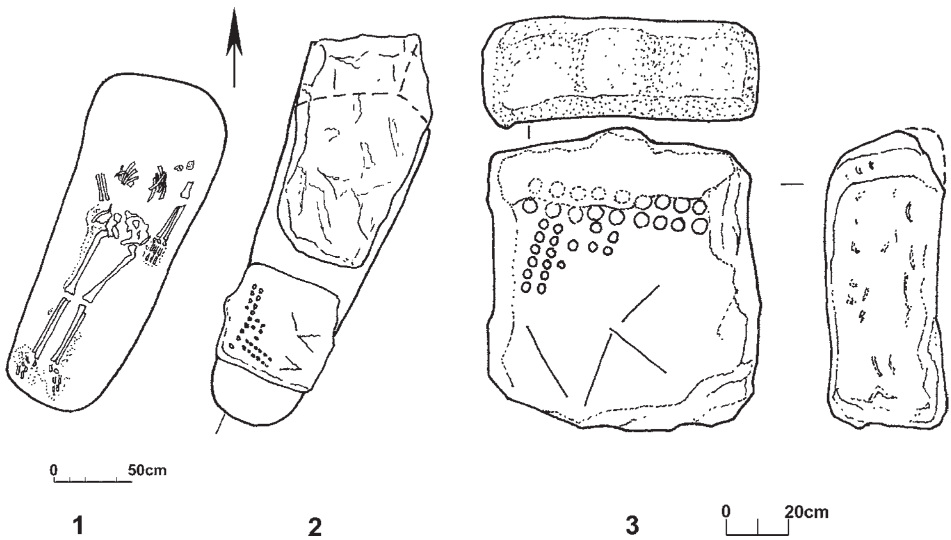

Figure 5.5 Grave 2/2 at Pervomaevka 1. Reproduced with permission by J. Rassamakin from Rassamakin (2004b, Pl. 40).

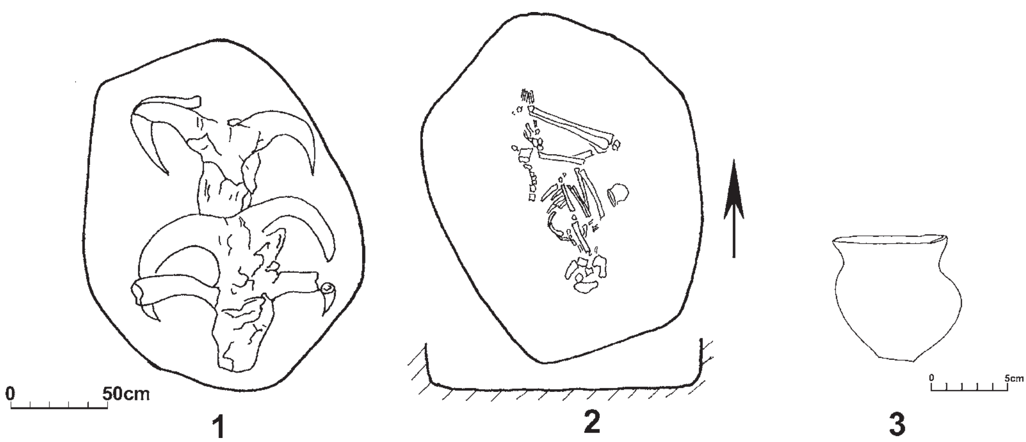

Figure 5.6 Grave 1/16 at Volchanskoe I. Reproduced with permission by J. Rassamakin from Rassamakin (2004b, Pl. 436).

of several centimetres.[14] Many graves contained shaped pieces of ochre (Fig. 5.4). Large "cakes" with lengths of up to 15 cm accompanied mainly the extended skeletons (Kamenka Dneprovskaja 14/2), while smaller ochre lumps were frequent in graves with flexed skeletons (e.g. at Malaja Alexandrovka 1/7) (Rassamakin 2004a, 34, 41, 53; 2004b, 17, 95, 176, Pl. 315, 2.3). Some grave pits were closed with stone slabs, large stones, or beams and were covered with a heap of stone rubble and an earth tumulus.[15] Several "primary" graves covered by a common mound were common.[16] Many kurgans were surrounded

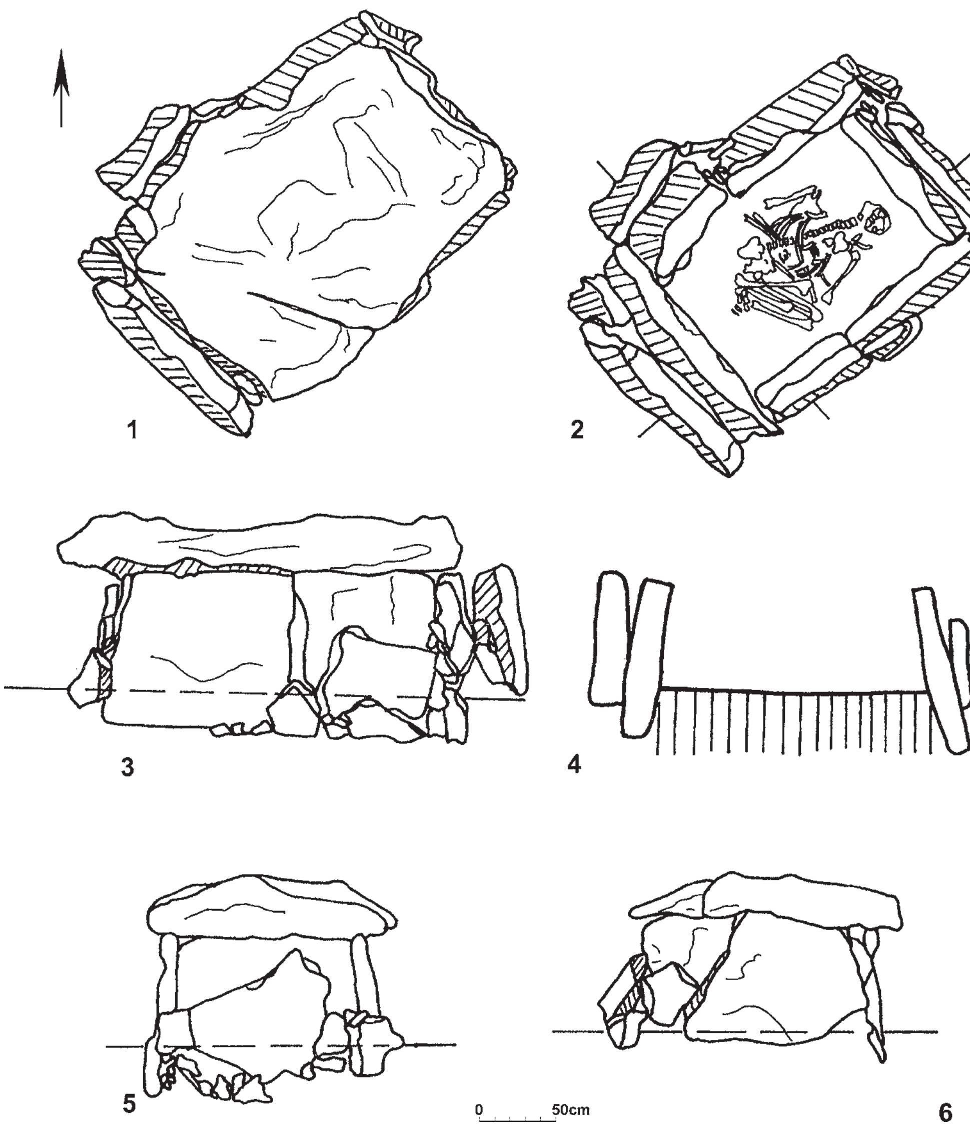

Figure 5.7 Grave 7 in Kurgan 14 at Ljubimovka. Reproduced with permission by J. Rassamakin from Rassamakin (2004b, Pl. 382).

by circular ditches and circles of large upright stone slabs (Fig. 5.18 later).[17] Traces of fire (ashes, charcoal), pottery sherds and fragments of animal bones under the barrows document the consumption of food during the funerals.[18] One to three kurgans were usually situated in a row on a terrace near the riverbank.[19]

The graves contained very few artefacts. Some of the deceased wore small pieces of decoration, e.g. simple copper ornaments and tiny bone and stone beads. Tools, weapons, pots and clay figurines were very rare. Single graves contained flint flakes and arrowheads, hammer stones, stone grinding plates, shaft-hole hammers of stone, and small pots. It has been suggested that the habit of placing ceramics in the graves developed under the influence of the village societies in the forest-steppe (Rassamakin 1999, 60). Remarkably, the vessels found in steppe graves were often exotic imports, while local-style pottery was recovered mainly among the remains of feasting (see Rassamakin 2000 about Kvitjana pottery sherds in remains of feasting). A striking case of a "rich" burial was provided by Grave 6 in Orekhov-Tarasova mogila, in which the body of a child was decorated with several leather items with copper applications, including a pectoral or tunic, a bracelet, and a belt (Rassamakin 2004b, 11) (Fig. 5.14, 5, later).

Skulls of large bovines in association with graves have been reported in several cases. At Volchanskoe 1/16, an adult individual lying flexed on the right side was covered with three skulls of large-horned cattle (Rassamakin 2004b, 140) (Fig. 5.6). Five skulls of bovids were situated near Grave 2 in Kurgan 4 at Ozernoe, while five large hornless skulls surrounded the child skeleton at Ordzhonikidze "Chernaja mogila" 3/10 (Rassamakin 2004b, 50; Nikolova and Rassamakin 1985, 39; 2004b, 50, Pl. 150). The presence of these animal heads hints at social gatherings accompanied by sacrifices of sizable animals and the distribution of substantial quantities of meat (see Davis and Payne 1993, 21). The skulls represent a rare manifestation of outstanding practices in a funerary context. A further example of extraordinary burial practices was provided at Kurgan 14 (Grave 7) at Ljubimovka, containing the skeleton of an adult individual placed flexed on the left side (Rassamakin 2004b, 122). A stone cist was constructed on the ancient ground surface and was covered with a small earth mound and a monumental stone shell surrounded by a circle of large stone slabs (Fig. 5.7). With its height of 3 m and diameter of 28 m, this barrow was possibly one of the largest Chalcolithic monuments in the steppe (Fig. 5.8). The grave at Ljubimovka was not

Figure 5.8 Kurgan 14 at Ljubimovka. Reproduced with permission by J. Rassamakin from Rassamakin (2004b, Pl. 381).

disturbed but grave goods, except the fragments of two large jars lying on the stone cover of the cist, were absent.

Thus, apart from the position of the body and some minor differences, the burial customs throughout the coastal plains were quite uniform. Common were funerary feasts, stone constructions, and the erection of a small kurgan over one or several graves. The inhabitants of the steppe shared these basic elements of the burial custom with the village societies in the valleys of Kuban and the lower Dnestr (see Chapters 4 and 6). Yet the imposing, exaggerated monumentality of some kurgans in the latter two regions appears entirely foreign to the practices in the plains north of the Black Sea. The graves in the Black Sea steppe were surrounded with small circles of upright slabs and not with monumental revetments of stone rubble measuring several metres in width and up to 40 m in diameter; the deceased were buried in narrow pits or small cists and accompanied only by a few small objects, not in large burial chambers or megalithic tombs loaded with exotic and valuable goods. The small size of the burial mounds is probably owing to a pattern of small and dispersed communities with limited possibilities to recruit working parties, in contrast to the large population concentrations of Usatovo and Maikop. Moreover, if the treatment of the dead is any indication of the social institutions and values of the living, the inhabitants of the coastal plains of the Black Sea maintained a rather egalitarian ethos. Accumulation of wealth may have been possible among the members of these small groups, yet its open presentation was apparently not considered socially appropriate.

FARMING IN THE GRASSLANDS

For almost three millennia, the natural grasslands north of the Black and Azov Seas were exploited by nomadic pastoralists. It is tempting to assume that this long-standing pastoral tradition was pre-determined by ecological factors and to project this view back into the prehistoric period. Indeed, cultivators in the steppe encountered greater difficulties in comparison to the forest-steppe farmers. While the annual rainfall, the length of the growing season and the soil fertility in the grasslands north of the Black Sea are sufficient for growing cereals, the open landscape suffers from strong dry winds, high rates of evaporation and unpredictable droughts. Low moisture causes reduced yields of following crops, and wind and water erosion in the unprotected flatland damage the areas exposed during fallow years. Moreover, the fertile but heavy black soils of the grasslands were difficult to break and cultivate with the simple tilling technology of the early farmers.[20] Even the driest parts of the grasslands, however, provided conditions for sedentary cereal cultivation by small communities of farmers, as demonstrated by the colonization of the Volga-Manych steppe by Russian farmers in the nineteenth century (Otchir-Goriaeva 2002, 117–121).

With the exception of two hoes and a flint blade with "sickle" gloss found at Mikhajlovka II (Bibikov 1962, 12) (Fig. 5.9, 1; Korobkova and Shaposhnikova 2005, 253), farming tools and archaeobotanical macrorests are absent in the archaeological record of the grasslands.[21] A study of pottery sherds with imprints of grains from Mikhajlovka showed that the inhabitants of this site grew a mixture of cereals and pulses dominated by emmer, hulled barley, broomcorn millet and bitter vetch (Pashkevich 2000, Table 5; Pashkevich 2003, 291).[22] This composition of species is very similar to the one cultivated in the forest-steppe zone, although grains of broomcorn millet are rare outside the steppe (Janushevich et al. 1993). Millet (*Panicum miliaceum*) is a summer crop adapted to dry environments and today features among the most important staples in drought-affected areas (Pashkevich 1997, 267; Emendack et al. 2005).[23] Not only its hardiness but also its extraordinarily short growing season of sixty days from sowing to harvesting might have made millet the crop of choice for small and seasonally mobile groups exploiting wild resources. In the

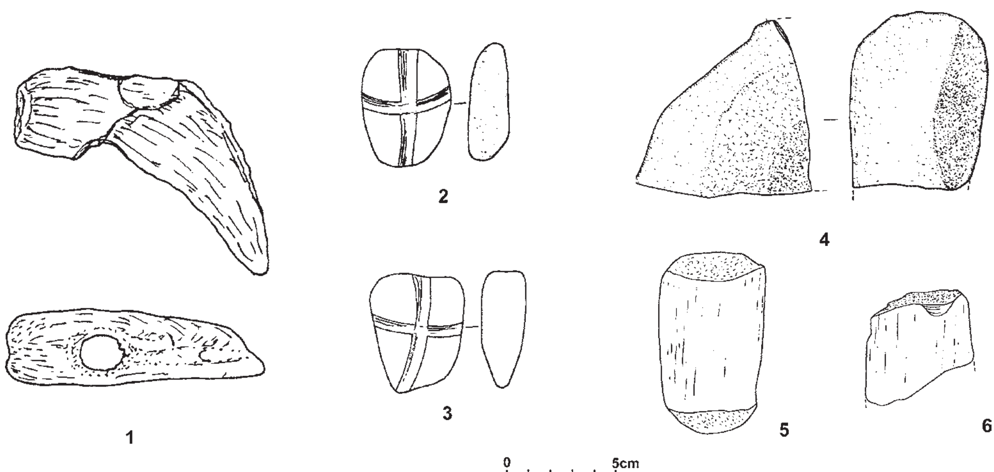

Figure 5.9 Tools from Grave 12/2 at Kamenka Dneprovskaja 2 (1) (reproduced with permission by J. Rassamakin from Rassamakin 2004a, Fig. 95, 8) and from the settlement of Mikhajlovka II (2–6) (after Korobkova and Shaposhnikova 2005). 1 antler; 2–6 stone.

absence of more specific evidence, the farming technology employed in the region between the southern Bug and the lower Don during the late fourth millennium BC remains a matter of conjectures.

Spring sowing might have been very advantageous in a steppe climate with long, cold and dry winters and a rainfall maximum in June. Risks of droughts and soil erosion might have been counterweighed by preferences for drought-resistant species, mixed cropping, and rotations of cereals and pulses. Moreover, the need for frequent changes of cultivated plots, a kind of "steppe shifting cultivation", might account for the ephemeral settlement pattern and the small size of the communities.

Storage installations or large storage vessels have not been reported from settlement sites in the steppe. Storage in large ceramic vessels, like the manufacturing of such containers, was possibly not commonly practiced. A clay platform that might have functioned as a podium for storage bins of woven reeds has been uncovered in House 1 at Mikhajlovka II (Korobkova and Shaposhnikova 2005, 35 f.; cf. Dhavalikar 1995). The processing of cereals is attested by a grinding installation found in situ in the cooking area of House 2 of Mikhajlovka II, and by microwear on saddle querns (Korobkova and Shaposhnikova 2005, 253, 116, Fig. 56, 2–4.6) (Fig. 5.9, 4–6). Everyday cooking took place in open hearths, that is on round platforms of beaten clay situated in the centre of the dwelling. A domed oven has been reported for House 1 at Mikhajlovka II (see Korobkova and Shaposhnikova 2005, 36).

The faunal materials from the second and third layers of Mikhajlovka, unfortunately, were not studied separately. Only data about the proportions of species and body size are available for this assemblage. Cattle were the most numerous domestic animals, followed by small ruminants and pigs (Bibikova and Shevchenko 1962). Sheep in Mikhajlovka I and in II-III had similar sizes, although they were significantly larger than the late-fifth-millennium sheep at the Tripolie A site of Luka Vrublevetskaja on Dnestr. Bibikova and Shevchenko (1962) interpret this inconsistence as evidence for two different sheep races, though it would be premature to assume the presence of the woolly sheep in Mikhajlovka on account of this observation. While it is not possible to differentiate between different models of herding on the basis of the available faunal data, reliance on animals seems an important strategy for risk buffering in dry grassland environments. The nineteenth-century farmer colonists of the Volga-Manych steppe, mentioned previously, were not able to produce surpluses of cereals for the market, though they could develop highly efficient strategies of fishing and cattle breeding. Year-round grazing supplemented with stall-feeding in winter and intensive fishing provided abundant produce to market and enabled a surprising prosperity (Otchir-Goriaeva 2002).

The role of animal herding in the exploitation of dry grassland environments varies along the wide spectrum between sedentary mixed farming with stall-feeding and full nomadic pastoralism. Was exclusive herding, however, a viable economic alternative for the inhabitants of the Black Sea steppes during the fourth millennium BC? The answer to this question depends on the mode of use of the animals. When most animals become usable only after being slaughtered, as a source of meat, culling has to be scheduled before the growth rate decreases. The keeping of large numbers of "unproductive" animals such as non-breeding mature individuals, especially through the long and cold winters of the grasslands, seems unfeasible and economically unreasonable. Thus, building of large herds and the need for cyclic seasonal migrations between different pastures seem highly improbable in such purely "carnivorous" modes of exploitation.[24] The situation changes dramatically, however, for pastoralists who have a good command of the technologies of milking and milk processing.[25] Dairying produces valuable foodstuffs that can be preserved and milking makes it profitable to keep large numbers of mature female animals. The technology of intensive milk exploitation appears to be the most important precondition for the development of extensive herding in the temperate zone. Thus, the answer to the above question remains negative until evidence for specialized dairying practices becomes available.

The faunal assemblage from Mikhajlovka I-III contained numerous bones of large mammal species hunted for meat and hides, among them wild boar, red deer, horse, wild ass, aurochs, and sajga antelope. Several species living in wetland environments, like otter, beaver, and water vole, were captured for their fur (Bibikova and Shevchenko 1962). Moreover, numerous Unio shells and fish scales have been found near the hearths in the dwellings at Mikhajlovka. Faunal studies identified several large freshwater species, predominantly catfish and pike (Lagodovskaja et al. 1962, 175). Tools for hunting and fishing, for example arrowheads, stone net weights and a fragment of a bone harpoon, have been reported from the lower and middle layers at this site (Korobkova and Shaposhnikova 2005, Tables 3 and 9, Fig. 59, 9–10) (Fig. 5.9, 2–3).

The species composition of the faunal assemblage from Mikhajlovka shows that the inhabitants of this site exploited both the floodplain forests and reedbeds, and the dry grassland. The equids (*Equus caballus* and more rarely *Equus hemionus*) are the most numerous species among the hunted animals (Lagodovskaja et al. 1962, Table 4).[26] Are the elevated numbers of horse bones an indication of the domestic status of this animal at Mikhajlovka? While the bones from Mikhajlovka have not featured prominently in the discussion about horse domestication, the faunal assemblage from the site of Dereivka in the forest-steppe zone on the middle Dnepr has been the subject of several archaeozoological studies with contradictory results (see Levine 1990, 2005, with references).[27] Recently, Levine (1990) concluded on the basis of age and sex data obtained from horse teeth that most individuals at Dereivka died between the ages of five and eight years, after a substantial decrease of growth rate but in their most productive years as beasts of burden. Domestic horses exploited for meat or as working animals are unlikely to produce such an age profile. The conspicuous male-female ratio of nine to one also contradicts the thesis of the domestic status of these animals. As pointed out by Levine (1990, 378 f.), the latter instead suggests hunting with stalking strategy targeting bachelor groups and young male adults.

The evidence for horse keeping at the mid-fourth-millennium site near Botai in northern Kazakhstan appears to be much more plausible. Here, studies of soil micromorphology and chemistry were able to identify horse-dung-filled soil by its specific morphology (French and Kousoulakou 2003) and residues on pottery vessels have provided evidence that milking of horses was "very likely" (Outram et al. 2009). However, the intensive involvement with horses in northern Kazakhstan cannot be interpolated to the whole Eurasian steppe during the fourth millennium BC.

It seems very likely that the seasonal exploitation of wild resources played an important role in the life of the steppe communities. Not only the faunal assemblages but also the habitations point in this direction. Gilman (1987) draws attention to the fact that the presence of subterranean dwellings in the ethnographic record almost invariably correlates with seasonal settlement mobility. For example, some inhabitants of the Northern Plains of North America, which were dependent on both buffalo and agriculture, built permanent settlements consisting of pit houses and planted crops in their vicinity. When the crops grew knee high, the group moved onto the plains to hunt, and returned to the settlement in late summer for harvesting. In winter, part of the group moved once again to a hunting site, usually situated in a sheltered, forested river valley (Gilman 1987, 545). It cannot be excluded that the subsistence economy in the plains of the north Black Sea involved similarly complex patterns of seasonal mobility for exploiting wild resources.

CONSERVATISM IN THE MANUFACTURING TECHNOLOGIES

Lithics

The inhabitants of the settlement at Mikhajlovka used local flint of low quality with grey and black colour. They apparently collected raw material in the riverbeds in the form of small nodules (Korobkova and Shaposhnikova 2005, 101). The flint assemblage from Mikhajlovka I-II included numerous nodules, cores and manufacturing debris. Flint knapping employed basically an expedient core technology for detaching irregular crude flakes by direct hard percussion (Korobkova and Shaposhnikova 2005, 101) (Fig. 5.10, 1). The flakes were used mostly with minimum secondary shaping (Korobkova and Shaposhnikova 2005, Fig. 48–50).

The study of the flint assemblage from Mikhajlovka II also recognized single artefacts of imported high-quality flint from the region of Volyn in the forest-steppe (Korobkova and Shaposhnikova 2005, 101). This material was obtained by the grassland communities in the form of long blades through a network of exchanges (see Chapter 7). Tools made of imported Donets flint with light grey colour also have been recovered from this site (Lagodovskaja et al. 1962, 115). The high-quality flint from the Donets ridge belongs to the most prominent exchange commodities of the late fifth millennium BC. Numerous quarries and specialized flint-working areas with huge quantities of production waste and semi-finished products have been identified in the area of the sources, while hoards of long regular blades, retouched triangular points, prepared cores, and nodules found at distant sites reflect a network of long-distance exchanges (Rassamakin 1999, 103; 2002a, 49). In the fourth millennium, the production and distribution of large blades apparently ceased, although the exploitation of the flint deposits continued, as demonstrated by the presence of Donets flint at Mikhajlovka.

The site of Mikhajlovka II provided numerous crude stone tools for grinding, crushing and pounding foodstuffs and minerals (Korobkova and Shaposhnikova 2005, 113 f., Fig. 54–58) (Fig. 5.10, 3–4). Polished stone tools with shaft-holes, however, are very rare finds.[28]

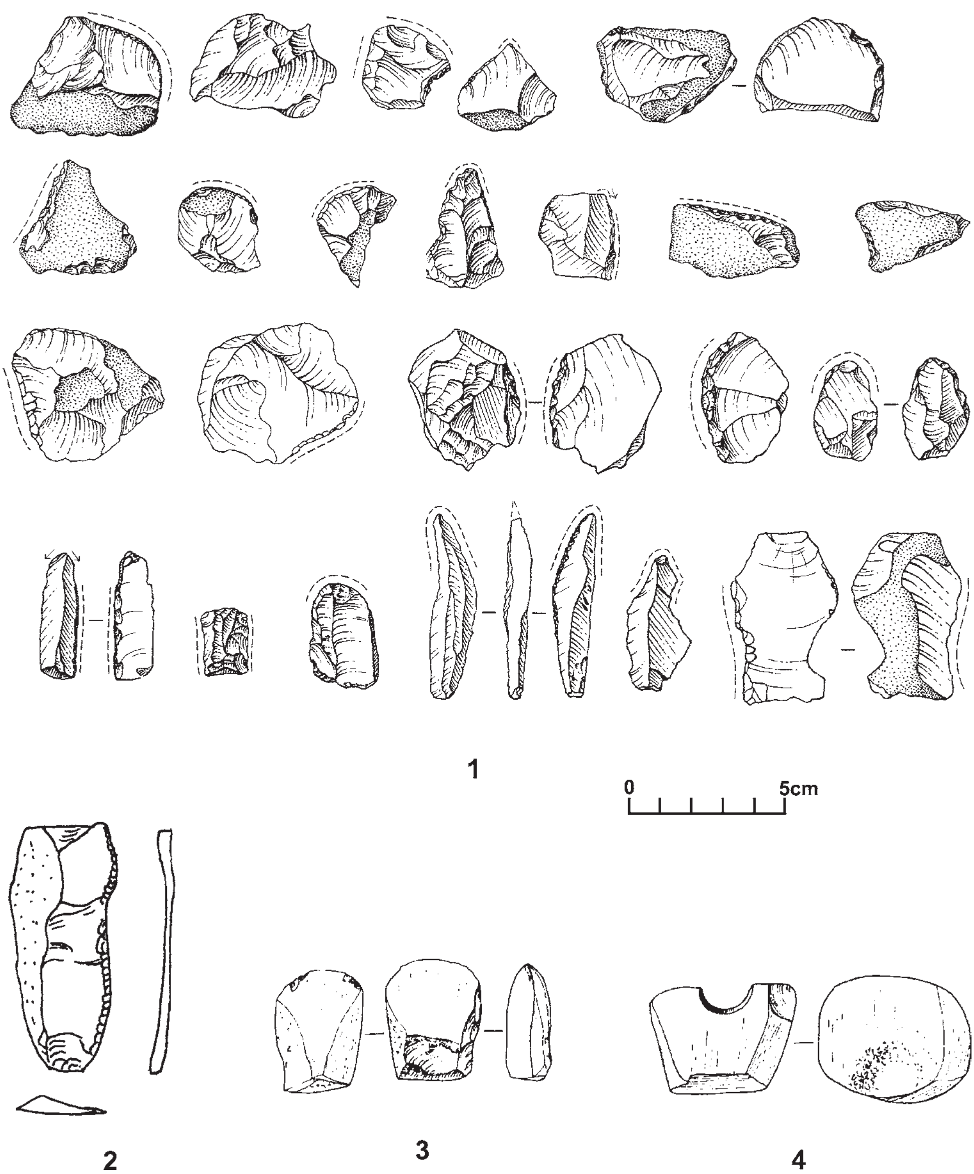

Figure 5.10 Stone artefacts from Mikhajlovka II (1.3.4) (after Korobkova and Shaposhnikova 2005) and Vinogradnoe 3/15 (2) (reproduced with permission by J. Rassamakin from Rassamakin 2004a, Fig. 95, 11). 1.2 flint; 3.4 stone.

Small white and black beads of marl, agate, and anthracite/jet have been reported from several kurgans in the coastal zone and in the valley of the lower Dnepr. Grave 4/2 at Primorskoe II contained light-coloured beads of marl (Rassamakin 2004b, 139, Pl. 432, 5). Small white (shell) and black (anthracite or agate) beads have been uncovered on the chest of the deceased at Vinogradnoe 3/41, Volchanskoe 1/21 and Chkalovskaja 3/19 (Rassamakin 1987, 37; Nikolova and Rassamakin 1985, Fig. 4, 8; Rassamakin 2004b, 15, 140, Pl. 37, 5, Pl. 436, 6). Furthermore, Grave 24 in kurgan "Radutka" at Kojsug provided a unique large black bead of lignite with a semi-spherical shape and incised decoration, three tiny cylindrical black beads of agate, and one white bead made possibly of bone (Maksimenko 1973, 254, Fig. 3, 6). These typical strings of tiny black and white beads find close comparisons in graves of the Usatovo period in the northwest part of the coast (see Chapter 6). The local manufacturing of stone beads by the steppe communities appears likely, but there is no information about manufacturing debris.

Ceramic Vessels

The potters of the steppe region between the lower Dnepr and Don preferred a ceramic body of clay mixed with crushed shells and sand (Korobkova and Shaposhnikova 2005, 50, 57; Rassamakin 2004a, 65, 105). This "shell-pottery" had a long-standing tradition in the region to the north of the Black Sea. Its origin remains obscure, though it was definitely not a part of the earliest pottery technology of the village societies in the forest steppe of the Ukraine and the Balkans. It is also unclear whether some perceived or actual advantage of this clay body was the reason for its exclusive use. Crushed shells as opening material can increase the workability of clays with high plasticity, which tend to shrink during drying and firing (Stimmell et al. 1982). Moreover, vessels of clay containing shell particles tend to be tougher and more durable in comparison to ceramics of clay mixed with sand (Feathers 2006, 111). However, shell admixtures create serious problems during firing. At temperatures exceeding 600°C, shell inclusions in the vessel walls may decompose to lime (calcium oxide). The latter readily absorbs moisture and expands, leading to damage of the vessel walls ("lime blowing"), which ranges between small pits on the surface and complete disintegration of the vessel (Feathers 2006, 92). Thus, clay bodies containing shells as opening material have to be fired in temperatures below the temperature of decomposition. If the vessels are fired with less oxygen, the risk of spalling diminishes and the firing temperature can be raised to 800°C (Feathers 2006, 119). Open firing at temperatures below 800°C and final smudging (smothering with dung, sawdust, or grass) of shell-tempered clay vessels may thus represent the common firing techniques used by potters in the steppe zone. The mottled dark surfaces of the pots; their dark brown, grey, and black colour; and the typical dark core of the fraction support this supposition. Evidence for kiln firing is not available.

The typical pointed-bottom vessels of the steppe assemblages were possibly shaped by coiling and finished by beating.[29] The flat-bottomed pottery at Mikhajlovka II was also hand-shaped by coiling (Korobkova and Shaposhnikova 2005, 58). Vessels with coarse or barely smoothed surfaces predominated in the pottery of the steppe communities. Decorations were limited to the neck and shoulders of the pots and included incised, stamped, and applied ornaments (Korobkova and Shaposhnikova 2005, Figs. 24–25, 27–31; Rassamakin 2004a, 191). Cord impressions, the hallmark of this period, were very common at the site of Mikhajlovka (Korobkova and Shaposhnikova 2005, 59 f., 62, Fig. 28, 29, 31). The origin of cord decoration is uncertain, although the question about its earliest occurrence is beginning to be resolved. Recently, sherds of imported vessels with "caterpillar" cord impressions have been reported from the settlement at Miropolie on the middle Dnepr dating to the early part of the Tripolie B2 phase, or around 4000 BC (Rassamakin 2002a, 50; Tsvek and Rassamakin 2002; 2005, 187–190). These sherds represent the earliest datable finds of cord impressions (Tsvek and Rassamakin 2002, 241 f.). "Real" or developed cord impressions appeared only in the following period, as demonstrated by the imports of vessels with cord decoration at the late Tripolie B2-C1 site at Garbuzyn (Tsvek and Rassamakin 2002, 241 f.).

The published ceramic evidence is not adequate for a well-grounded attempt to group the pottery vessels from the settlements and graves into ceramic wares. It seems that one possible ware is represented by the flat-bottomed jars and beakers which occur in the whole coastal area, that is in the lower course of Ingulets, on both sides of the lower Dnepr and along the west coast of the Sea of Azov (Fig. 5.11). The vessels were shaped from a coarse clay body with shell inclusions and fired at low temperatures to a brown or grey mottled colour. This group encompasses only a few shapes, almost exclusively jars with carinated bodies; low, wide, out-turned necks and smoothed surfaces. Componential pottery, for example vessels with ring bases, legs, spouts, lids, lugs and handles, is absent. This ceramic ware is possibly related to the pottery tradition of the Tripolie culture (Rassamakin 1999, 114).

A second type of vessel has been reported from the Crimea and a restricted area between the lower Dnepr and Molochnaja (Fig. 5.12). Several traits of these vessels, for example their round bottoms, spherical bodies, thin walls and dark grey burnished surfaces, are unfamiliar to the ceramic tradition of the steppe. They are usually regarded as imitations of north Caucasian pots and not as imports, since the clay often contains significant shell admixtures and the shapes deviate slightly from the Caucasian prototypes (Rassamakin 2004a, 129).

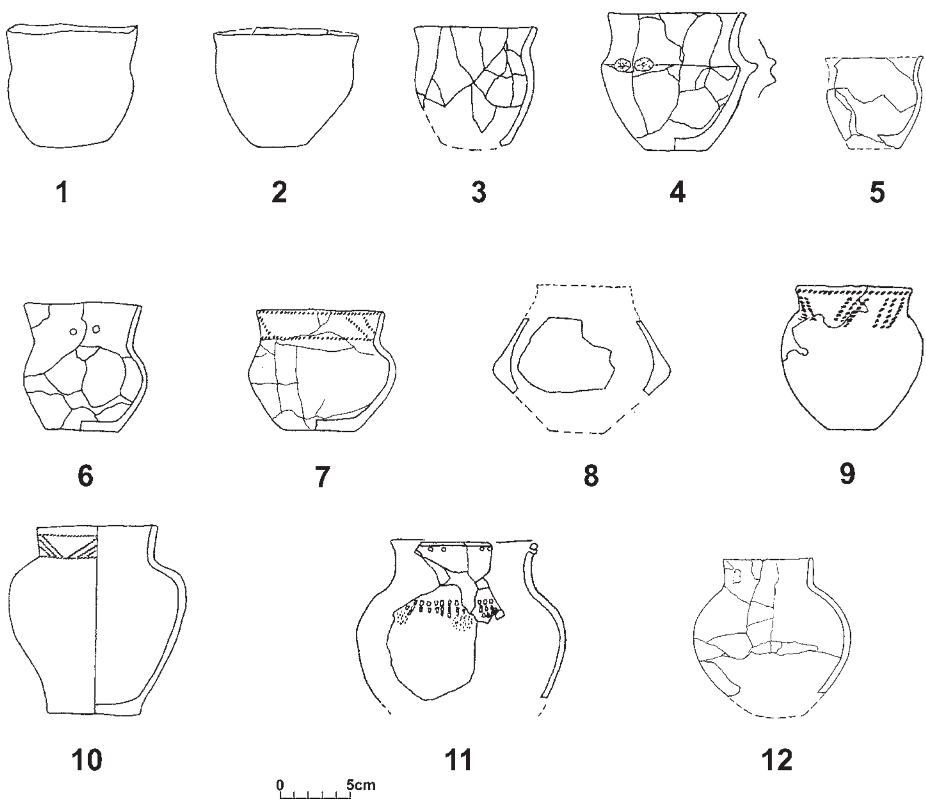

Figure 5.11 Flat-bottomed pottery vessels from graves: Volchanskoe I 1/21 (1–2), Vinogradnoe 14/1 (3), Primorskoe I 1/2 (4), Zolotaja Balka (5), Osokorovka, Grave 12 (6), Obloi 2/4 (7), Kovalevka VII 1/2 (8.11), Ozernoe 4/3 (9), Kalinovka II 4/8 (10), and Malaja Alexandrovka (12). Reproduced with permission by J. Rassamakin from Rassamakin (2004a, Figs. 83, 84, 98, 102 and 103).

A third possible ware includes jars with slightly pointed, egg-shaped bodies and wide, low necks, shaped from coarse clay bodies with inclusions of crushed shells, and characterized by mid-quality firing and dark surface colour (e.g. Kvitjana, Konstantinovka and Repin style vessels; see Rassamakin 1999, 83–87, 117, 125, Figs. 3.21, 3.45 and 3.46). Specific features of some vessels are their rich decoration of impressions with a toothed tool, stick and cord, bosses at the base of the neck, and incised lines (Korobkova and Shaposhnikova 2005, 59 f., Fig. 27), which seems to imitate woven basketry. This type of ceramic has certainly developed in the steppe inhabitants' own pottery-making tradition.[30] Striking for the pottery of the steppe is not only the complete lack of componential vessels and specialized shapes and sizes, but also the extremely restricted repertoire of forms in all three wares, essentially limited to the ubiquitous middle-sized coarse jar.

Metals

Spectrographic analyses conducted by Chernykh in the 1960s showed the presence of two basic types of copper in Eastern Europe during the prehistoric period, pure and arsenic-rich copper.

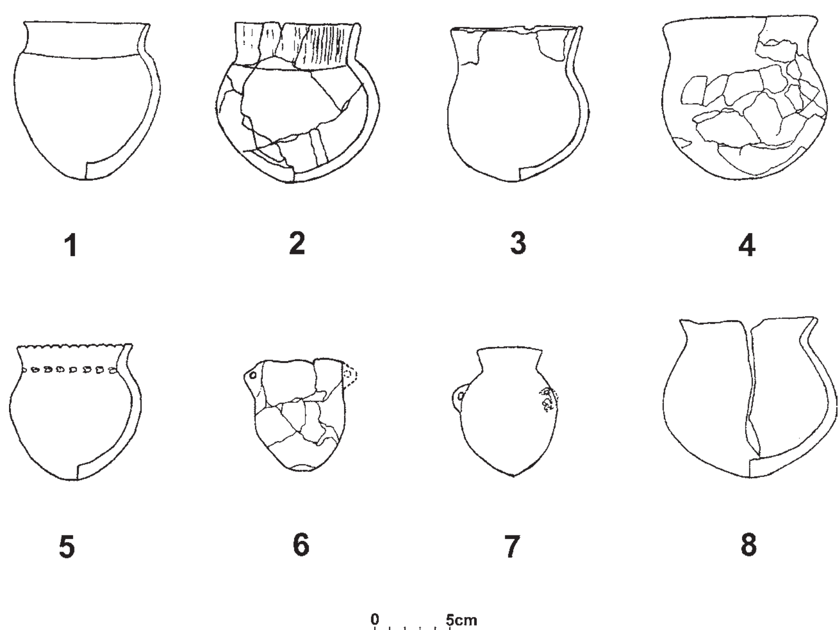

Figure 5.12 Pottery vessels with round bottoms from graves: Vasilevka 2/10 (1), Kamenka Dneprovskaja 8/12 (2–3), Skadovsk (4.7), Novopilippovka, Akkermen I 11/3 (5), Vinogradnoe 2/4 (6) and Ljubimovka 7/5 (8). Reproduced with permission by J. Rassamakin from Rassamakin (2004a, Fig. 99, 103).

Chernykh assumed that both metal types were of foreign origin and were obtained through long-distance exchanges from far-off regions like the southern Caucasus and the Balkans (Chernykh 1992, 151 f., Fig. 3). This explanatory model was widely accepted for the steppe zone north of the Black Sea (see Černych 2003, 34, for discussion and references). However, the grasslands are not completely devoid of copper and arsenic minerals. Native copper, high-grade copper oxides (azurite, malachite), copper sulphides (e.g. chalcopyrite), and arsenic-bearing minerals can be collected in the Donets Basin, for example in the valley of the river Bakhmut (Černych 2003, 50 ff.; Tatarinov 1977, 193; Klochko et al. 1999).[31] The Bakhmut valley was an important mining and metallurgical centre of the Srubnaja culture during the second millennium BC. Excavations and surveys in the areas of the copper sources have revealed open mining, galleries and slag heaps dating to this period (Tatarinov 1977; Černych 2003, 51). Settlements of the Srubnaja culture in the vicinity of the mines provided evidence for crushing and grinding tools, a smelting furnace, slags, and crucible fragments (Tatarinov 1977). Earlier exploitation of the deposits cannot be excluded, since the chemical composition of ores from the Bakhmut deposits matches the unalloyed copper used by the Jamnaja, Catacomb and Kemi-Oba cultures of the third millennium BC (Klochko 1994, 142). The question of their use during the fourth millennium BC remains unresolved.

Smelting equipment and installations are absent in the archaeological record of the coastal region during the Chalcolithic period, though this situation can be the consequence of limited research on settlement sites. Hammer stones for crushing and grinding minerals have been identified by microwear analysis outside the immediate coastal zone among the finds from a fourth-millennium grave at Verkhnaja Maevka in the valley of Samara, a left tributary of Dnepr (Černych 2003, 50, Fig. 12, 1–2) (Fig. 5.13). These tools were associated with a slagged crucible and a casting mould (Rassamakin 2004b, 31, Pl. 89–91). Moreover, moulds, slagged crucibles, and a possible tuyere have been reported from the late-fourth-millennium settlement at Konstantinovskoe on the lower Don (Kijashko 1994, 57, Fig. 35, 1–5).[32]

Objects of unalloyed copper predominate among the finds which have been subjected to spectral analysis. About two-thirds of the copper artefacts from the Dnepr region analyzed by Ryndina

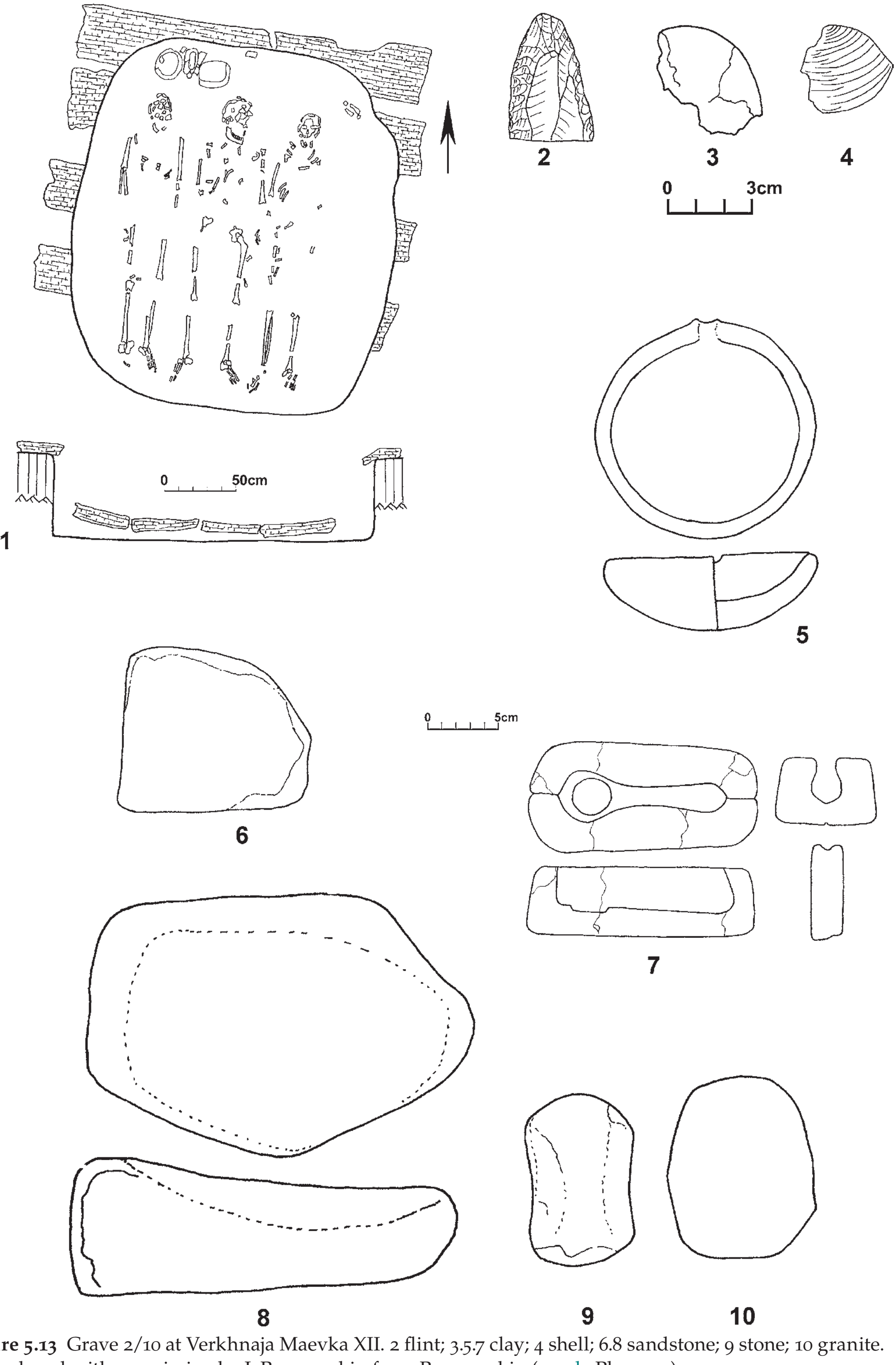

Figure 5.13 Grave 2/10 at Verkhnaja Maevka XII. 2 flint; 3.5.7 clay; 4 shell; 6.8 sandstone; 9 stone; 10 granite. Reproduced with permission by J. Rassamakin from Rassamakin (2004b, Pl. 90–91).

(1998, 171 f.) consisted of copper without significant admixtures, while the rest contained low proportions of arsenic. Similarly, two of the metal objects from the grave at Dolinka in the northern Crimea, a shaft-hole axe and a "fork", were cast of unalloyed copper, and three further objects contained arsenic (Korenevskij 1974, 24). Thus, while arsenical copper was unquestionably used in the steppe area, it is uncertain whether the local metallurgists regularly prepared copper-arsenic alloys. The preference for pure copper was definitely a local peculiarity of the grasslands, since unalloyed copper was not characteristic of the metallurgy of Usatovo to the west or that of Maikop to the east of the Black Sea steppe.

In the steppe, locally manufactured copper artefacts appear frequently from the middle of the fifth millennium onwards. The metalworkers of the late fifth millennium mastered the melting of copper and the casting of small metal objects, for example preforms for pendants and bracelets (Ryndina 1998, 161, 166 f., 168, 170, 181). Complex casting techniques such as the manufacturing of large objects with a shaft-hole in composite clay moulds, however, were adopted in the steppe only in the late fourth millennium. The use of clay bivalve moulds, for example, is attested in two regions situated outside the immediate coastal zone. On the lower Don, fragments of crucibles and bivalve moulds for shaft-hole axes have been reported from the settlement at Konstantinovskoe (Kijashko 1994, 57 f., Fig. 35, 1–4). Moreover, a complete set of casting equipment, including crucibles with spouts and bivalve moulds for shaft-hole axes, has been found in a grave at Verkhnaja Maevka XII, 2/10 on Samara (Rassamakin 2004b, 31) (Fig. 5.13).[33]

The evidence from the coastal zone is more ambiguous. Fragments of two different bivalve clay casting moulds for shaft-hole axes have been reported from a grave in Zolotoj Kurgan near Simferopol in the Crimea (Nechitajlo 1987, 18; Černych 2003, Fig. 3, 2.4). The dating of this grave, however, is uncertain. The chemical composition of some large cast objects found in the coastal region also hints at their local manufacturing. For example, two of the finds at Dolinka mentioned previously, a shaft-hole axe and a fork, consisted of unalloyed copper, which is completely untypical of Caucasian metallurgy (see Chapter 4). The former object was apparently cast in a bivalve mould, the latter in a lost-wax technique (Fig. 5.21 later).

Copper sheets and wire were two of the basic products in the metalwork of the fourth millennium in the steppe region.

Metallographic investigations of copper artefacts from graves in the area of the Dnepr rapids and Samara demonstrated that sheets were manufactured from cast preforms by cold-hammering and annealing (Ryndina 1998, 174 f., 178). Wire was produced by cold-hammering and annealing from strips cut out of pieces of copper sheets (Ryndina 1998, 177). Sheet metal and wire were further processed into small items of personal decoration by cutting, bending and rolling. These techniques have close parallels in the metalwork of the forest-steppe zone during the Tripolie period (Ryndina 1998, 174 f., with references). There is little doubt about the local production of small copper items. On the one hand, Ryndina (1998, 178) regards the inferior quality of these objects as a clue to their local steppe origin. Moreover, use-wear analysis of stone tools from Mikhajlovka II showed the presence of tools for metalworking, essentially for the manufacturing of small ornaments, like hammer-stones, polishing stones and small stone anvils (Korobkova and Shaposhnikova 2005, 121).[34]

The inventory of metal artefacts from the steppe zone north of the Black Sea consists mainly of small and simple ornamental items

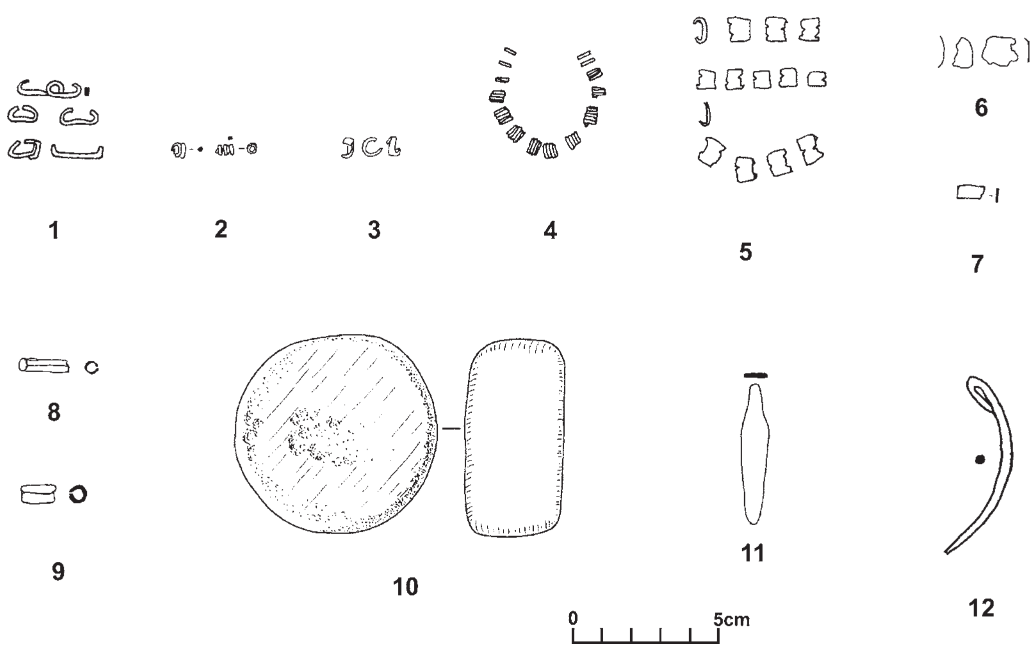

Figure 5.14 Copper artefacts from graves at Novopilippovka, Akkermen I 13/7 (1), Kamenka Dneprovskaja 2 12/2 (2.7.8), Osokorovka II, Grave 7 (3), Vishnevatoe 2/2 (4), Orekhov-Tarasova mogila (5), Novovorontsovka 1/8 (6), Kamenka Dneprovskaja 8/12 (9), Kojsug II 5/24 (11) and Volchanskoe I 1/21 (12) (reproduced with permission by J. Rassamakin from Rassamakin 2004b, Pl. 436, 7) and a stone anvil from the settlement of Mikhajlovka II (10) (after Korobkova and Shaposhnikova 2005, Fig. 58, 2).

(Fig. 5.14).[35] Most numerous among the small objects are spirals of copper wire.[36] Less common are rolled tubular beads of copper sheet and rolled sheet applications. Remains of leather inside some of the applications suggest that they were used as decorations for clothing and belts (Rassamakin 2004b, 11).[37] Further small items used for decorating leather were the so-called staples (Fig. 5.14, 1).[38] Tubular beads and spirals were very popular in the metalwork of Tripolie B2 to C2 (Ryndina 1998, 74 f., with references).[39] The applications and staples, however, represent a local form of ornament of the steppe (Ryndina 1998, 175).

Copper awls have been found at Mikhajlovka II (Korobkova and Shaposhnikova 2005, 121), Sergeevka 1/2 and Kamenka Dneprovskaja 12/2 (Rassamakin 2004a, 13). Finds of large copper objects, however, are very infrequent in the steppe zone. Flat axes and daggers are absent, and the only larger copper tools which appear with some consistency are the shaft-hole axes (see Korenevskij 1974).[40] Only one of these finds, the axe from Dolinka in the north Crimea, originates from a secure and datable context (Kolotukhin 2008) (Fig. 5.21, 3, later). It is important to stress that both the shaft-hole axe from Dolinka and the casting moulds from the valleys of Orel and Samara in the interior of the steppe, with their long and narrow blades, differ considerably in shape from the Caucasian types.[41]

In conclusion, the grave from Verkhnaja Maevka allows a unique glimpse into the most advanced metallurgical technology practiced by the inhabitants of the Black Sea grasslands. It shows that some communities of the steppe region north of the Black Sea collected, stored, prepared, mixed and smelted copper and its minerals. The craftspeople in these communities had full command of the concepts and skills for handling metal as a liquid. They were able to prepare clay melting crucibles and moulds for large shaft-hole tools, melt and skillfully pour large quantities of copper into the moulds to produce preforms, and to shape them by hammering. The acquisition of these skills certainly requires longer periods of learning and closer interaction between the experienced craftsperson and his apprentice. The archaeological evidence for this complex metalworking tradition is limited to the lower Don, the valleys of Orel and Samara and possibly the Crimea.

In contrast, a simple technical system of metalworking, involving the handling of metal as a plastic solid material, that is the "tooling" of sheet and wire into lustrous red copper appliqués by cutting, rolling, bending and polishing, is attested with numerous finds across the whole grassland area (Rassamakin 2004a, Fig. 56a).[42] Hammering, cutting and bending do not necessarily entail conceptual adjustment and advanced skills. The rolled sheet tubular beads, appliqués, staples, and spirals from the north Black Sea region strikingly resemble the metal items manufactured from imported native copper by the inhabitants of the northeastern United States in the late Archaic and Woodland periods. During the early contact period (mid-seventeenth century), these indigenous communities that never developed a tradition of smelting and casting shifted from local copper to European-introduced metal and manufactured the same traditional ornaments from imported kettles, reworking them by unsophisticated techniques of cutting, annealing and bending (Ehrhardt 2005, 108–119).

Transport

Excavations of Kurgan 6 at Novoalexandrovka I, situated on one of the right tributaries of Dnepr, revealed several graves dating to the fourth millennium BC. The primary Grave 16 contained the skeleton of an adult, lying extended on the back and accompanied by ochre cylinders. The dating of Grave 16 to the second half of the fourth millennium BC is substantiated by a large broken vessel of "Kvitjana type" found under the barrow in the vicinity of the grave. The deceased was placed in a wooden structure that was erected directly on the ancient surface and consisted of a frame of large wooden planks and a construction of smaller pieces of wood fastened with cord (see Rassamakin 2004b, 40, Pl. 11). The excavator Kovaleva assumes that the wooden structure represents the box of a covered wagon (*kibitka*) (see Gej 2004, 187, with references).[43] However, the absence of remains of wheels raises serious doubts about Kovaleva's reconstruction. Cists of wood (and stone) erected on the ancient surface are characteristic for the group of graves with extended skeletons and the interpretation of the structure at Novoalexandrovka as a wooden cist seems very likely (Rassamakin 2004a, 27 f., Fig. 23).

Only one grave from the later fourth millennium BC yielded wooden wagon wheels. In 1983, the Azov Museum conducted excavations of kurgans at Koldyri I on the left bank of Manych.[44] Grave 7 in Kurgan 14 contained the skeleton of an adult individual lying flexed on the left side, with hands placed in front of the face. The deceased wore a gold ornament. In its uppermost part, the grave pit widened into a flat and wide "ledge", on which lay the wheels of a wooden wagon. Three of them were well preserved and had a diameter of c. 0.80 m (Rassamakin 2002a, 51). The wheels belonged most probably to a two-axled heavy wooden wagon, comparable to the typical vehicles of the third-millennium Jamnaja culture.

During the second half of the fourth millennium BC the lower Don developed under the strong technological influence of the north Caucasus (see the "Concluding Remarks" section of this chapter), and it appears very likely that the wagon technology also arrived in this region from the Caucasus piedmont. The archaeological record suggests that, north of the Black Sea, the wagon was widely adopted only during the first half of the third millennium BC. The spread of wheeled transport in the grasslands was possibly a case of "re-invention" (in the sense outlined in Chapter 2) and must have dramatically increased the mobility of the steppe inhabitants.[45] Along with other technological and social factors, the easier transport of loads and people might have been crucial for the rapid and profound change of lifestyle and subsistence during the third millennium in the steppe.

Domestic Architecture

The excavations at Mikhajlovka I produced evidence of four buildings with oval floor plans (Fig. 5.2). Postholes have not been recognized. The clay floors of the dwellings were uncovered under a 0.40 m thick layer of burned reeds, ashes, and fired clay. These remains suggest, according to the excavators, that the buildings had thatched roofs and light walls constructed of bundles of reeds plastered with daub (Korobkova and Shaposhnikova 2005, 30–38).[46] Sod may have also been used in the architecture of the grasslands north of the Black Sea, since sod bricks (cut patches of sod) are convenient building materials in areas without access to wood and stone. Sod construction, which is notoriously difficult to identify in the archaeological record, may account for the almost complete absence of architectural remains at settlement sites in the grasslands.

Mikhajlovka provided evidence for habitation structures with subterranean floors (see Korobkova and Shaposhnikova 2005, 30 f.). Several explanations have been suggested for the habit of constructing "pit houses".[47] For example, in order to achieve the necessary height of the dwelling without good timber, especially long tree trunks for supporting posts, the builders sometimes needed to dig the floor 0.3–0.5 m into the ground (Dhavalikar 1995).[48] Moreover, subterranean structures provide well-protected and insulated winter dwellings in open grassland environments. Pit houses are superior to above-ground structures in terms of thermal efficiency because they are hardly affected by wind and daily temperature fluctuations, and take advantage of the heat stored in the soil (Gilman 1987, 452).[49] However, subterranean structures suffer from several major disadvantages in comparison to rectangular above-ground dwellings. The most serious problems of pit houses are fast deterioration and high maintenance costs. Since earth dwellings are poorly isolated from dampness, timber posts decay quickly and the structures become infested with insects after a relatively short use-life (McGuire and Schiffer 1983, 291). Moreover, pit houses are as a rule one-room structures with rounded ground plans, since the construction of rectangular contiguous subterranean rooms is difficult (Gilman 1987, 557). This peculiarity of subterranean architecture becomes a major constraint when lifestyle demands partitioning and construction of adjoining structures, with their superior possibilities for storage and differentiation of household activities. Above-ground buildings, in contrast, can be constructed easily in rectangular form and with agglutinating plans. Indeed, the ethnographic record shows that subterranean buildings were almost exclusively used as cold-season dwellings in bi-seasonal settlement systems (Gilman 1987, 541 f.). Agriculturalists, for example, can leave their pit houses after planting the crops and return for harvesting, storage and wintering (Gilman 1987, 553).

SOCIAL REPERTORY AND LONG-DISTANCE CONTACTS

In contrast to their western neighbours in the forest-steppe zone, the Chalcolithic communities in the grasslands of the North Black Sea did not manufacture and use clay figures of humans and animals or models of objects with domestic connotations (e.g. dwellings, vessels, furniture, etc.). The only exceptions are the so-called "Serezlievka-type" statuettes. These abstract human representations have been found in a limited area between the south Bug and the right bank of Dnepr in graves with flexed skeletons lying on the left side and extended skeletons (Rassamakin 2004c, Fig. 5 and Table 3) (Fig. 5.15).[50] The fine clay bodies of which the figurines were shaped, their decoration and, indeed, the idea of representing the human body in clay are foreign to the material culture of the steppe communities and possibly derive from forest-steppe traditions (Rassamakin 2004c). The Serezlievka-type figurines are reminiscent of the statuettes of the Usatovo group. Their association with the mortuary realm, predominantly with graves of children, also has a correspondence in the region of Odessa and the lower Dnestr (see Chapter 6).

Communities in the north Black Sea used large stone slabs, shaped roughly with the outlines of a human body, to cover the graves of their deceased.[51] There are also upright slabs with depictions of animals. For example, the primary burial in Kurgan 1 at Velikaja Alexandrovka on Ingulets was surrounded by a circle of vertical stone slabs; two of the slabs in the preserved part of the circle were decorated with relief depictions of animals coloured with red pigment – a possible wild boar and two smaller figures of dogs on the one and a bovine animal on the other (Rassamakin 2004b, 127, 153) (Fig. 5.16). The only comparisons for these reliefs are the stele with depiction of a dog from Usatovo I-11 and the two vertical slabs with animal depictions, possibly horses, from Usatovo I-3 (Patokova 1979, 47, Fig. 19, 7, and Fig. 25).

Stone grave architecture reached its peak in the second half of the fourth millennium BC. To the repertoire of rubble stone rings and stone heaps of the preceding period were added cists, stelae, and circles of large vertical slabs.[52] The prevailing interpretation considers burial mounds in Eastern Europe as an "invention"

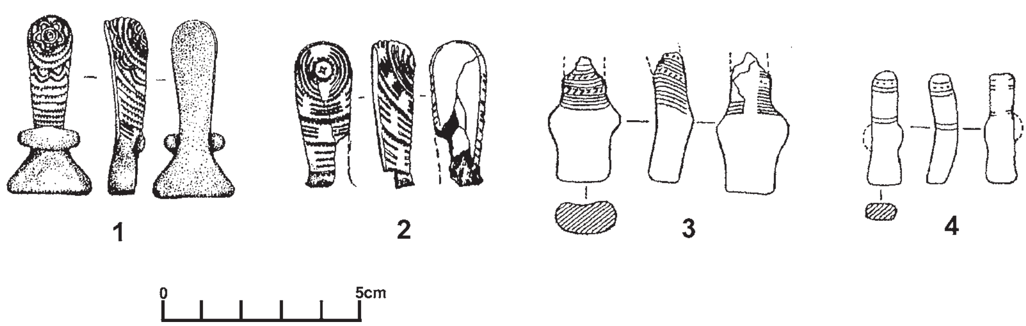

Figure 5.15 Clay figurines from graves at Novoalexeevka 6/15 (1–2) and Baratovka 1/17 (3–4). Reproduced with permission by J. Rassamakin from Rassamakin (2004c, Fig. 2).

which took place in the steppe cultural milieu (for a review see Rassamakin 2002a, 60–66). While this might actually be the case, monumental grave architecture of this scale and complexity is unlikely to have developed in isolation.[53] Manzura (2005a, 334) draws attention to the coincidence of the first barrows with increased contacts between the farmers of the forest-steppe and their steppe neighbours during the late fifth and early fourth millennia, which is clearly demonstrated by imports of forest-steppe pottery and metal artefacts. He suggests that monumental graves were built by lineages that came under the influence of the ideology of the forest-steppe farmers and describes the burial monuments as "instruments of conversion" to farming. Similarly, Bradley (1998, 11, 63) observed that the adoption of cereal cultivation among the mesolithic hunter-gatherers of northern Europe overlapped with the appearance of monuments associated with the dead. Bradley (1998, 33 f.) argues that the building of monuments was incompatible with the views and concepts of the hunter-gatherers, who did not perceive human identity in opposition to nature and whose

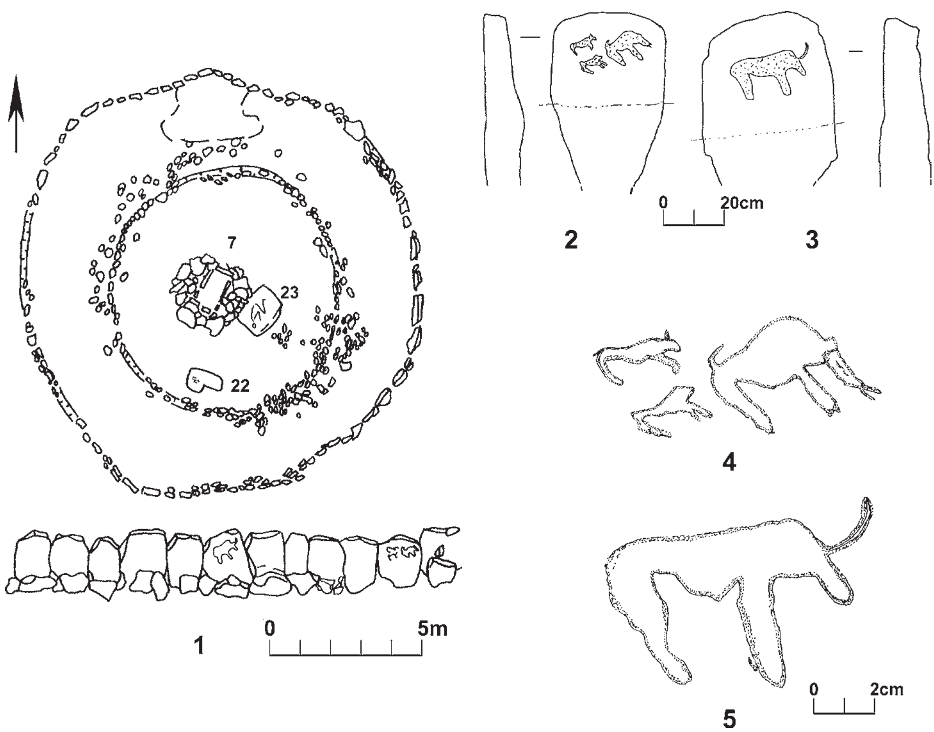

Figure 5.16 Kurgan 1 at Velikaja Alexandrovka. Reproduced with permission by J. Rassamakin from Rassamakin (2004b, Pl. 400).

places of special social significance were natural sites rather than artificial structures created by humans.

However, how did the relation between monumentality in the mortuary sphere and the spread of farming into the margins of Europe come into being? Sherratt (1990, 149) argues that plant cultivation requires different mechanisms for recruiting labour teams and scheduling subsistence tasks in comparison to hunting and gathering. The continuing commitment to a particular community and place, necessary for successful long-term cereal cultivation, was ensured by the village settlement pattern of central European (and originally Near Eastern) type. In the absence of large stable communities among the recently "converted" hunters of northern Europe, Sherratt argues, burial monuments took over as expressions of permanence and continuity.[54] This compelling explanation might be valid for the steppe margins of the southeastern European farming world as well. Once present in the social repertory, the construction of burial mounds constantly altered the natural environment and converted it into a human-made landscape. This is especially pertinent for the open landscape of the grasslands and it cannot be excluded that strong territorial consciousness and land ownership appeared as a consequence, rather than being the cause, of the kurgan tradition.

If the artefacts that accompanied the deceased into the grave are any indication of the spectrum used by the living, the inhabitants of the coastal plains of the Black Sea had a rather limited choice of materials and objects to express social distinctions and values. Body painting in red colour played a central role in the burial rituals and possibly also in the rituals of the living. Thus, high-quality pigments, especially ochre and cinnabar, were possibly a prized commodity for exchange and social display. High-quality ochres can be obtained at the Izyumskij deposit, while large deposits of cinnabar are situated in the Donets valley.[55] A further pigment which might have been a rare material with social significance is the so called "rose ochre", found in the form of lumps, cylinders and "loafs" in the graves (Rassamakin 2004a, 34, 41, 53–55) (Fig. 5.4, 2). Kovaleva (see Rassamakin 2004a, 34) has suggested that this substance was an artificial mix of ochre with white kaolin. However, it seems more probable that it was actually a natural material, a form of impure kaolin coloured pink by iron oxide.

The inhabitants of the steppe manufactured a number of rather unsophisticated personal ornaments of bone, stone, and copper, for example necklaces of tiny white and black stone beads and various leather items decorated with shining red copper applications (breastplates, bracelets, belts). Some of the deceased were dressed in clothes decorated with an enormous number of tiny beads on the chest and waist (e.g. Kojsug 5/18 in the Don delta, Maksimenko 1973, 252). Another typical local decoration is strings of X-shaped beads cut from a rib bone (Fig. 5.17).[56] Imported exotic commodities, like painted vessels manufactured by the farmers of the forest-steppe and flint from the deposits of Volyn, are infrequent finds in the region between Dnepr and Don (Fig. 5.18).[57] From the north Caucasus, the inhabitants of some steppe regions obtained very infrequently pots and objects of copper, silver and gold.[58]

CONCLUDING REMARKS

At the end of the fourth millennium BC, a new type of grave emerged in the plains of the north Black Sea. These graves of the so-called

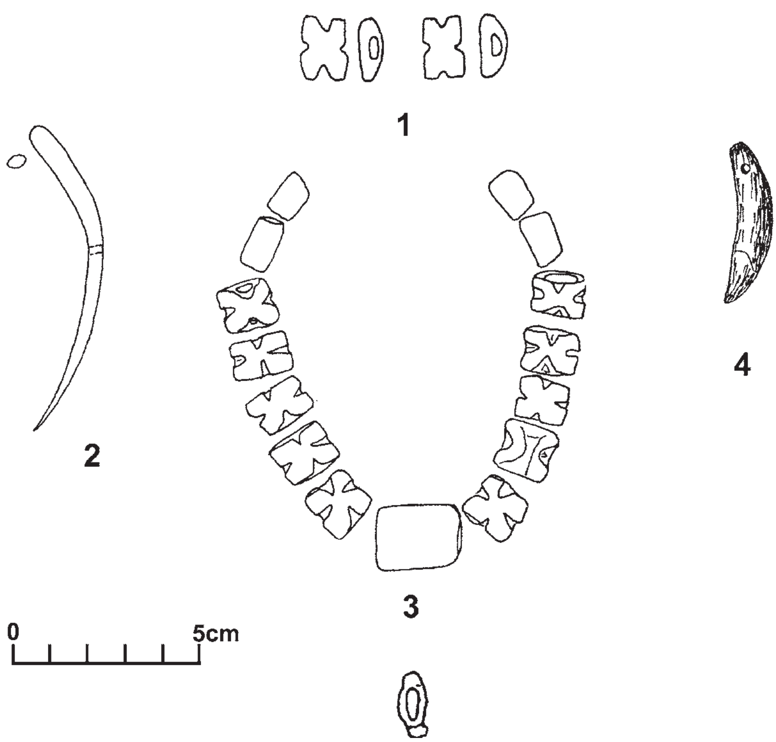

Figure 5.17 Decorative items of bone and animal teeth from graves at Vinogradnoe 2/2 (1), Kojsug II 5/18 (2), Vishnevatoe 2/2 (3), Natashino 13/4 (4). Reproduced with permission by J. Rassamakin from Rassamakin (2004a) and after Kolotukhin and Toshchev (2000, Fig. 135), respectively.

Zhivotilovo type are scattered across the whole area between Don and southern Bug, mainly along the Azov coast and in the northern Crimea, but also on both sides of the lower Dnepr and in the region of the Dnepr rapids and Samara (Rassamakin 2004a, 209, Fig.

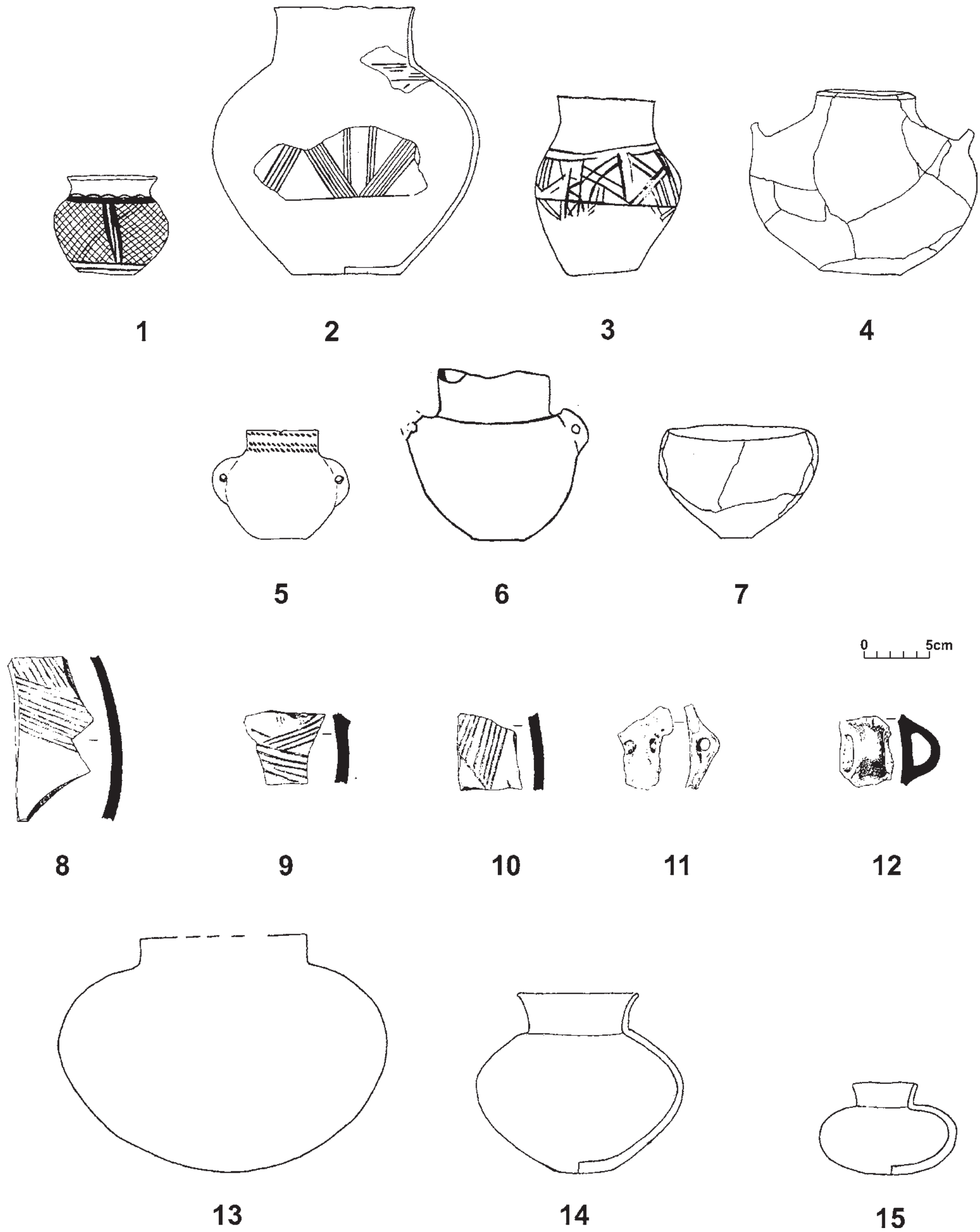

Figure 5.18 Imported pottery vessels from the graves at Ljubimovka 23/4 (1), Velikaja Alexandrovka 1/23 (2), Vishnevatoe 2/4 (3), Volchanskoe I 1/21 (4), Novoalexeevka (5), Volchanskoe II 1/6 (6), Volchanskoe I 1/30 (7), Alexandrovka 1/2 (13), Ordzhonikidze, Chkalovskaja group 3/32 (14) and Dolinskoe 1/38 (15) (reproduced with permission by J. Rassamakin from Rassamakin **2004a**, Fig. 94, 98, 99, 102 and 103) and from the settlement at Mikhajlovka II (8–12) (after Korobkova and Shaposhnikova**2005**, Fig. 32).

11; Kovaleva 1991). They form a coherent group in terms of ritual and artefacts, and differ from all other grave assemblages by the marked presence of both north Caucasian and southeast European elements.[59] The stratigraphic position of these graves supports the impression that they supersede the long-established burial customs of the steppe population. Rassamakin (1999, 97; 2004a, 209) even speculates about a "colonization" of the steppe by the late Tripolie and Maikop farming cultures. It is likely that the Zhivotilovo group acted as an intermediary between the Caucasus and southeastern Europe. However, it seems that this interaction did not significantly alter the technological practices in the grasslands. Only the communities in the immediate Caucasian margin were directly confronted with the highly sophisticated technological traditions of the north Caucasian population.

In the first place, the inhabitants of the lower Don developed a "provincial" variety of these traditions, partly importing its products (pottery, copper tools and jewelry of precious metals) and partly adopting its practices in the realms of culinary technology, metalwork, ceramics and transport (Fig. 5.19).[60] Moreover, the communities of the Crimean peninsula also seem to have accepted some elements of north Caucasian material culture. Regrettably, we remain largely uninformed about this key region. In the hilly southern Crimea, excavations at several settlements and graves provided pottery

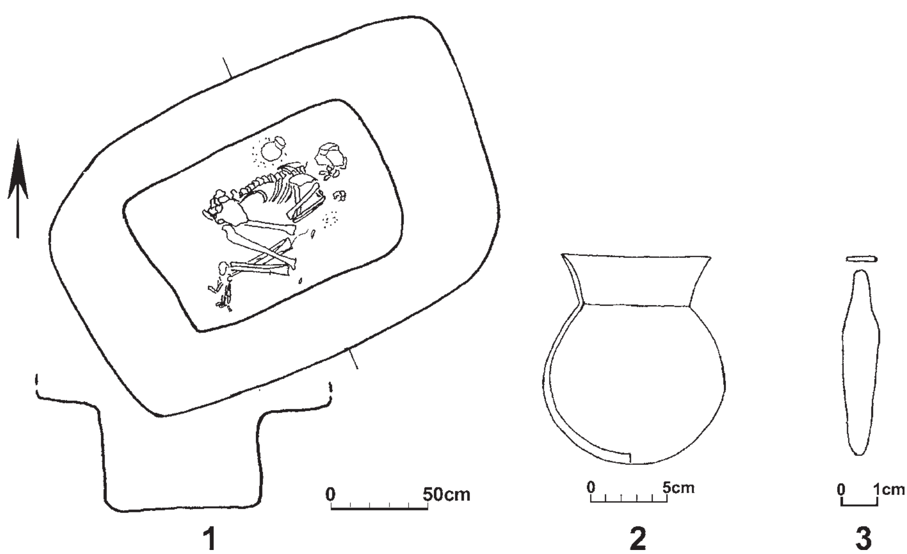

Figure 5.19 Grave 5/24 at Kojsug II on the Lower Don. 2 pottery, 3 copper. Reproduced with permission by J. Rassamakin from Rassamakin (2004b, Pl. 472).

vessels that are reminiscent of the Caucasian types (Ivanova et al. 2005, 144) (Fig. 5.20).[61] A stray find of a shaft-hole axe from Balaklava has close comparisons in terms of shape and chemical composition among the axes of Maikop (Korenevskij 1974). In the steppe of the north Crimea, graves with Maikop-related vessels, for example spherical jars with low collars and bell-shaped beakers, have been reported from Risovoe and Tselinnoe (Rassamakin 2004b, Pl. 445, 2, and Pl. 450, 2). Some elements of the burial rite, too, are of apparent Caucasian origin. For example, a painted stone cist and a grave with pebble flooring have been excavated at Vilino (excavations in

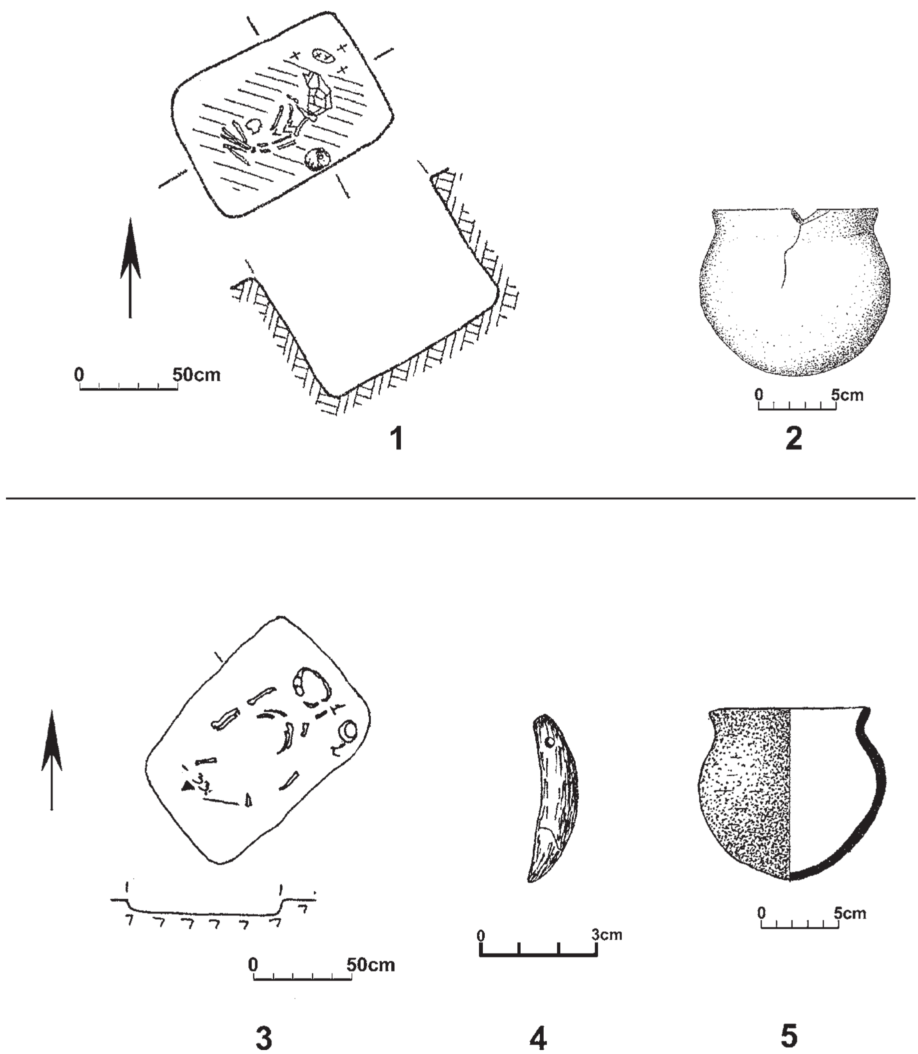

Figure 5.20 Graves at Chistenkoe 1/11 (1–2) and Natashino 13/4 (3–5) in the Crimea. After Koltukhov and Toshchev (1998, Fig. 24) and Kolotukhin and Toshchev (2000, Fig. 135).

1980, Grave 3 and 4; Khrapunov 1992; Nechitajlo 1987, 20). Another painted stone cist uncovered at Dolinka (Kurgan 1, Grave 3) contained a group of metal artefacts with clear Caucasian affiliation (Kolotukhin 2008) (Fig. 5.21).

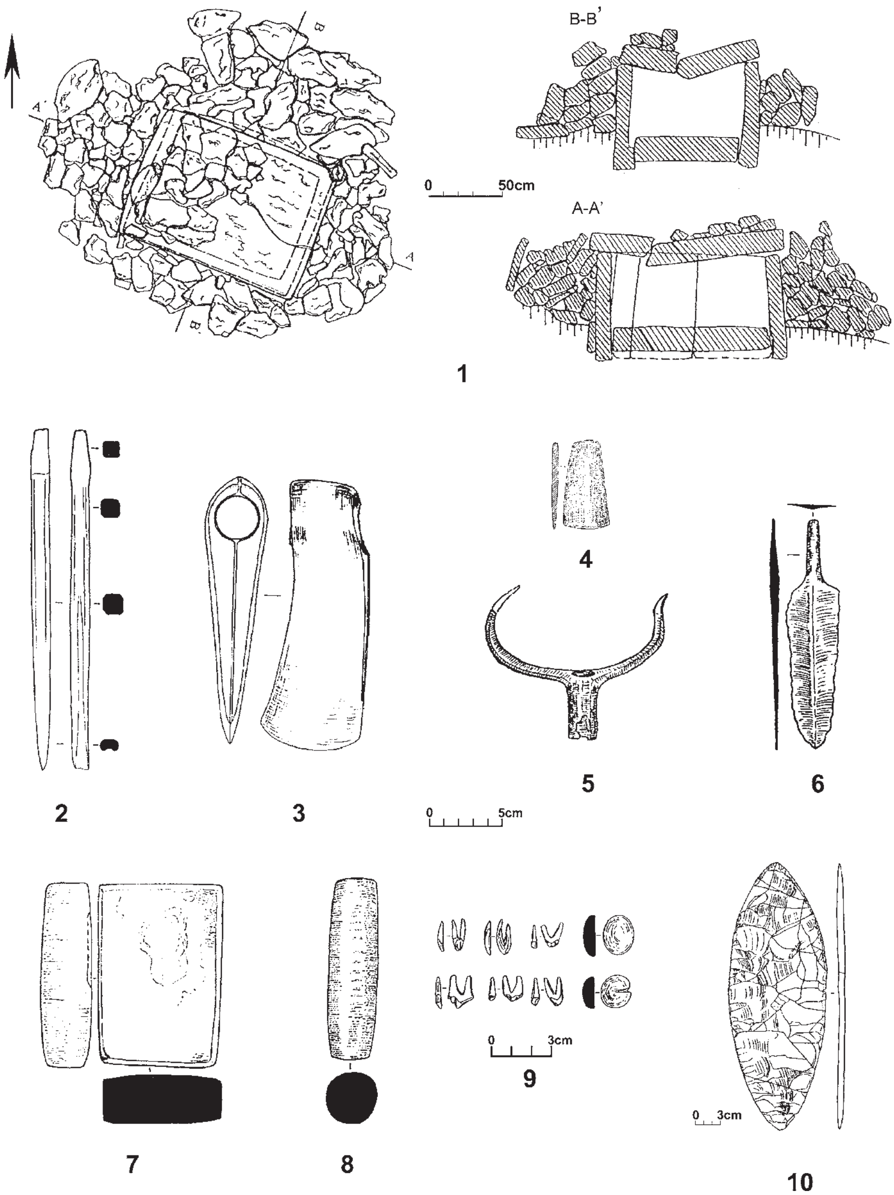

Figure 5.21 Grave 3 at Dolinka. 2.3.4.5.6 copper, 7.8 stone, 9 animal teeth and bone, 10 flint. After Kolotukhin (2008).

6

Wetlands of the Western Black Sea

INTRODUCTION

Archaeological Fieldwork

Systematic research at sites of the fourth millennium BC in the region between southern Bug and the Danube began with the excavations at Usatovo-Bolshoj Kujalnik under the direction of Boltenko in the 1920s.[1] Boltenko introduced the term "Usatovo culture" for the material assemblage he uncovered at this site. Excavations of the kurgans and flat cemeteries at Bolshoj Kujalnik were renewed in the 1960s by Patokova, joined later by Zbenovich (Patokova 1979). Petrenko excavated further kurgans in 1984–1985.[2] A second major site of the Usatovo culture was investigated not far from the estuary of Dnestr at Majaki. Zbenovich revealed the remains of a settlement there in 1964–1965 and 1970, while a contemporary cemetery of kurgans and flat graves was investigated by Patokova in 1974–1975 (Zbenovich 1971; Patokova 1980; Patokova et al. 1989). Petrenko undertook further excavations, in both the settlement and the cemetery, in 1986.[3] Usatovo and Majaki remain the only fourth-millennium settlement sites in the coastal area between southern Bug and the Danube that have been subject to archaeological excavations.

Most data for the region northwest of the Black Sea originate from burial mounds. The sites cluster along the lower Dnestr and scatter westward between Dnestr and the Danube delta.[4] Scientific excavations of Chalcolithic kurgans in this region intensified only after the World War II. Several graves came to light at Tudorovo in 1959

(Meljukova 1962) and at Sarata in 1961 (Zbenovich 1974). During the 1960s, large-scale rescue investigations, initially in the area between Dnestr and the Danube (the "Budshak steppe") and later in other parts of the grasslands, accompanied the construction of irrigation systems in the dry steppe. The largest of these archaeological projects was the *Dnestr-Danube Rescue Expedition*, which started in 1963 under the direction of Shmaglij. In 1964–1968, this expedition concentrated on the dry steppe on the left bank of the Danube. Excavations took place at the sites of Bolgrad (Subbotin and Shmaglij 1970), Ogorodnoe (Subbotin et al. 1970), Nerushaj, Bashtanovka, Glubokoe, and Borisovka (Shmaglij and Chernjakov 1970).[5] In 1977–1985, some twenty Usatovo kurgans were excavated between the Sasyk and Khadzhider Lakes, most of them forming a middle-sized cemetery at Zhovtij Jar (Subbotin and Petrenko 1994).

Field research continued on a reduced scale during the late 1980s and the investigations concentrated on the region of the lower Dnestr. Graves of the Usatovo period came to light in 1980–1984 at Taraklia 2 (Dergachev and Manzura 1991, 47–50) and in 1987–1989 in the vicinity of Slobodzea at Ternovka (Agulnikov and Savva 2004). On the present seacoast, the Odessa Archaeological Museum conducted excavations in 1990 at Sadovoe (Maljukevich and Petrenko 1993) and in 1993 at Alexandrovka (Videiko and Burdo 2004b, 389 f.). The area between Dnestr and the south Bug remained almost unexplored, with the exception of several graves of the Usatovo period at Katarzhino and Zalts, investigated by the Odessa Centre for Conservation of the Archaeological Monuments in 1990–1991 (Ivanova et al. 2005) (Fig. 6.1).[6]

The steppe of Dobrudzha south of the Danube delta remains a largely unexplored terrain. Excavations at the major site of Cernavoda-Dealul Sofia took place with interruptions between 1954 and 1970. The hill comprised three discrete settlement areas – an early-fourth-millennium site on the west slope (Cernavoda I), a later habitation area of the fourth millennium on the summit (Cernavoda III) and an almost completely destroyed third-millennium settlement at the foot of the hill (Cernavoda II) (Morintz and Roman 1968, 46) (Fig. 6.2). The site on the summit of the hill provided series of characteristic artefacts, such as fluted pottery, vessels with tunnel lugs, and anthropomorphic figurines with separate heads, that are now considered as defining for the "Cernavoda III culture" (Roman 2001 with references).

This characteristic material has been encountered at a few other sites in the western littoral. Investigations at the Roman fortress near Orlovka on the right bank of the Danube, for example, yielded Chalcolithic pottery including sherds with affiliations to Cernavoda III and Usatovo (Bondar and Petrenko 2005). Furthermore, Cernavoda III material in stratigraphic position came to light during excavations at the settlement mound on the island in Lake Durankulak (Draganov 1990).[7] A cemetery in the vicinity of the mound included seventeen graves in small kurgans dating to the late fourth millennium (Todorova 2002, 50).[8] Most recently, rescue excavations in the vicinity of Dragantsi near Karnobat revealed dwellings and pits

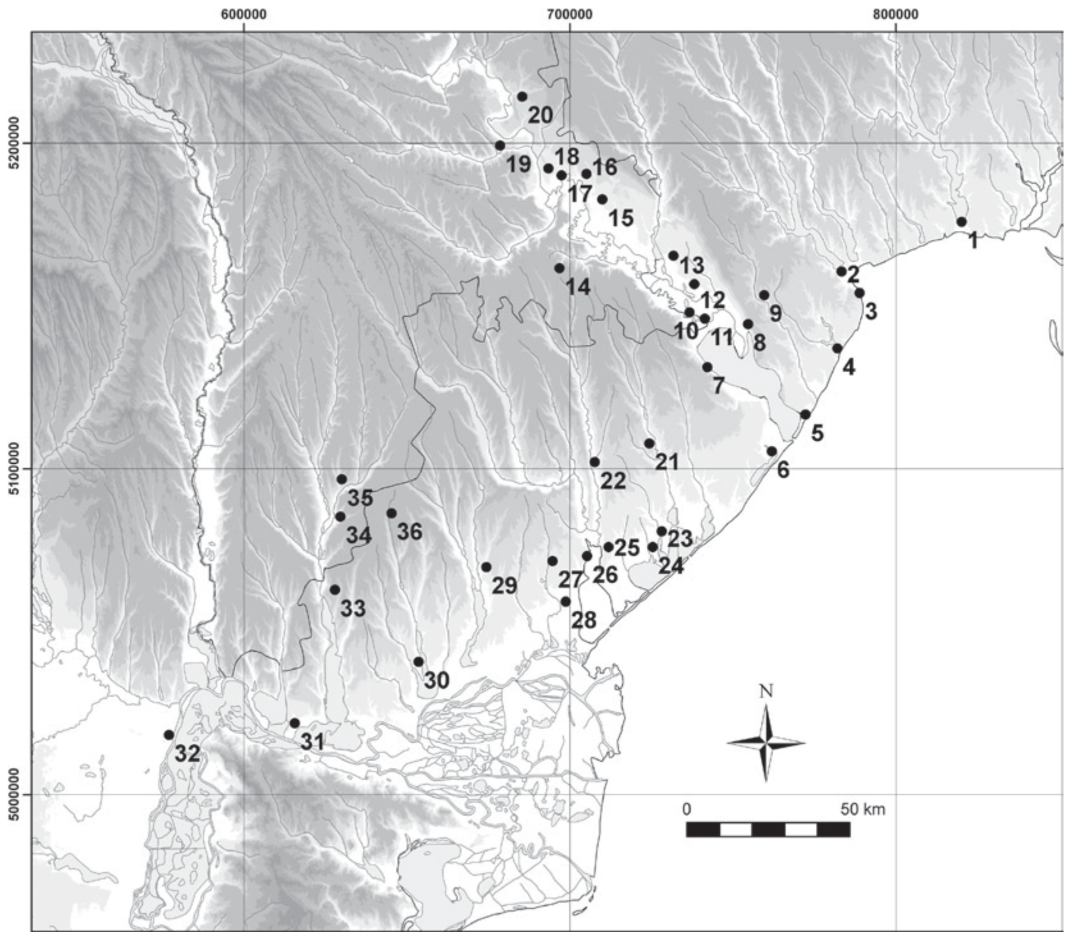

Figure 6.1 Principal sites of the Usatovo group: (1) Koshary, (2) Usatovo, (3) Odeskij kurgan, (4) Alexandrovka, (5) Akkiembetskij kurgan, (6) Sadovoe, (7) Semenovka, (8) Majaki, (9) Mirnoe, (10) Palanka, (11) Tudorovo, (12) Jasski, (13) Gradentsy, (14) Purkary, (15) Slobodzija, (16) Sukleja, (17) Ternovka, (18) Parkary, (19) Roshkany, (20) Butory, (21) Khadzhider, (22) Sarata, (23) Zhovtij Jar, (24) Kochkovatoe, (25) Trapovka, (26) Borisovka, (27) Bashtanovka, (28) Nerushaj, (29) Kholmskoe, (30) Utkonosovka, (31) Orlovka, (32) Brailiţa, (33) Bolgrad, (34) Taraklia, (35) Kazaklia, (36) Ogorodnoe.

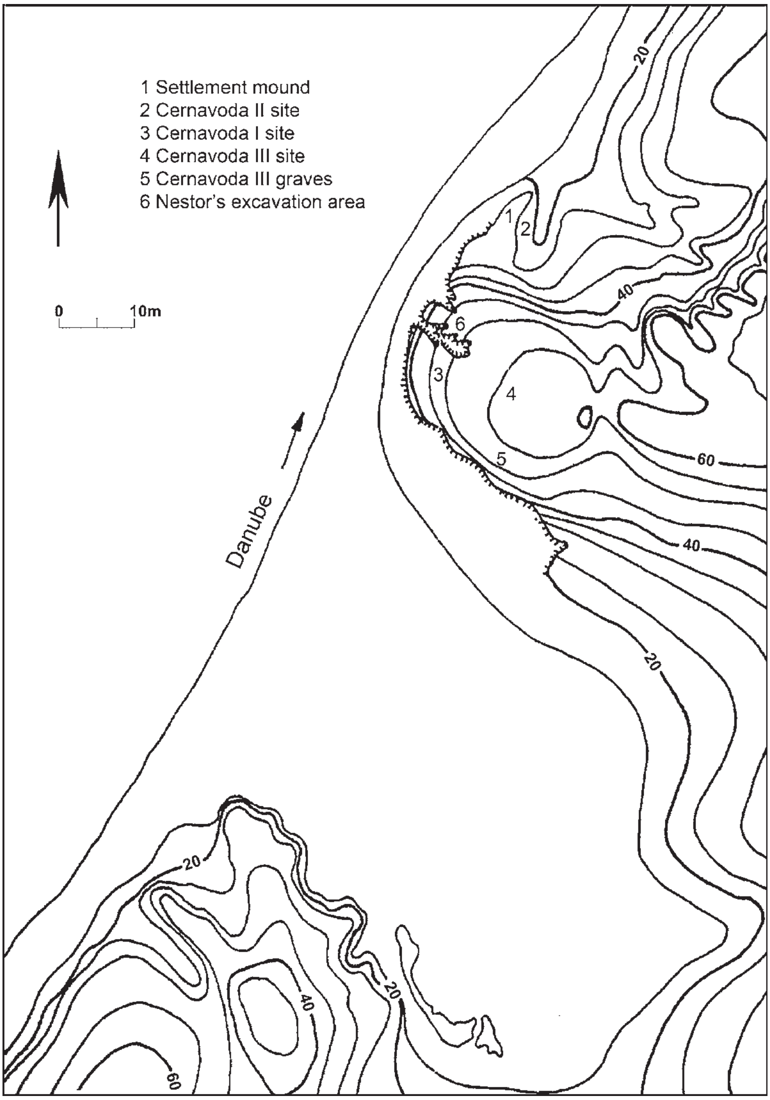

Figure 6.2 The site of Cernavoda-Dealul Sofia. After Roman (2001, Fig 2).

associated with Cernavoda III–type pottery (Gergova et al. 2010). Farther to the south, a settlement with material reminiscent of Cernavoda III has been investigated during underwater excavations in front of the mouth of Ropotamo (Draganov 1990, 162) (Fig. 6.3).

Synopses

An early overview of the Usatovo group appeared in Passek's (1949) monographic work dedicated to the chronology of the Tripolie culture. The first comprehensive study about this Chalcolithic phenomenon, however, was published in 1974 by Zbenovich. His book

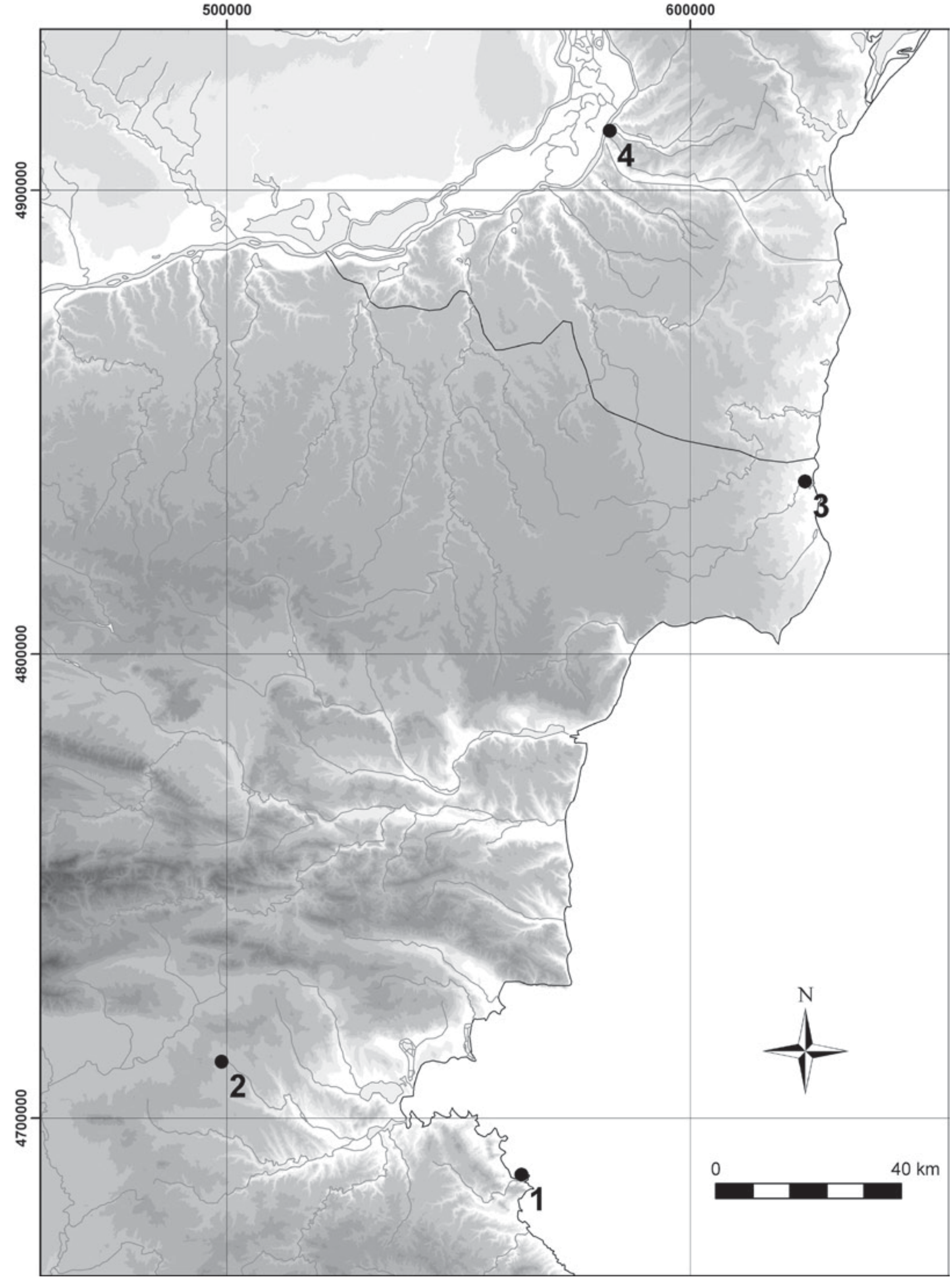

Figure 6.3 Fourth-millennium BC sites on the west coast of the Black Sea: (1) Ropotamo, (2) Dragantsi, (3) Durankulak, (4) Cernavoda.

summarized the data about settlements and cemeteries, small finds and pottery, economy and society, chronology and external connections of the Usatovo group. Furthermore, Zbenovich addressed the question of its origin and its place among the local variants of the late Tripolie culture.[9] In his explanatory model, overpopulation on the middle Dnestr brought about migration into the steppe areas on the lower course of the river. The characteristic Usatovo assemblages emerged through the migrants' adaptation of the economy and material culture to the arid grassland environment and was shaped by their interactions with the local inhabitants (Zbenovich 1974, 147–150).

Since Zbenovich's synopsis, no attempt has been made to summarize and evaluate the evidence from new field investigations.[10] However, our understanding of the Usatovo group has significantly improved through comparisons with other prehistoric groups northwest of the Black Sea. Manzura (1990) explored the relationship of Usatovo with the preceding local archaeological assemblages and argued that the Usatovo-type material culture and burial customs emerged under the influence of two different traditions, Tripolie and Cernavoda I. Examples of this cultural cross-pollination are, in his opinion, the construction of chernozem barrows along with flat graves, the further development of stone circles and cairns, and the emergence of larger cemeteries and rich graves. The association of these developments with a movement of people from the core areas of Tripolie has not yet been seriously challenged.[11] Petrenko (1989, 20) describes the emergence of Usatovo as consequence of a "Tripolie diaspora" and Manzura (2005a, 332) envisages the process as a "real migration" and "a mass exodus of Tripolie communities to the steppes".

There is no comprehensive synthesis about the Cernavoda III culture, except for the first overview of the archaeological evidence published by Morintz and Roman in 1968.[12] Even though the eponymous site is situated near the Black Sea, Cernavoda III is apparently not a phenomenon bound to the coastal region. The prevailing explanation regards it as a peripheral variant in a large "cultural zone" centering on the Carpathian basin (Maran 2004a, 266, with references). Most researchers agree that the material found at Cernavoda III, and especially the pottery with black channeled surfaces, did not originate in the northwestern Black Sea area but rather stands in the pottery tradition of the northern Balkans.[13] Manzura (2003) assumes that it emerged through an eastward expansion from the interior of the Balkans and acknowledges that some of its traits might have originated in the Carpathian basin (Manzura 2003, 333 f.).

Chronology

The Chalcolithic graves in the region between Tiligul and the Danube have been classified in several groups according to burial rites and finds, while stratigraphic observations during excavations of larger kurgans have provided some evidence for their chronological sequence. A group of graves with skeletons lying in flexed position on the side, which contained very few finds and were covered by kurgans with monumental features, can be reliably dated to the Tripolie C1 period through imports of painted pottery (Manzura 1990, 184 f.).[14] This group stratigraphically precedes the graves of the Usatovo period.[15] The Usatovo group itself can be securely tied to the Tripolie chronology, and thus to the southeast European chronological scheme, through the painted pottery vessels found in its settlements and graves. The latter closely resemble the pottery of the Vykhvatintsy and Kasperovtsy (Gorodineşti) groups of the late Tripolie period on the middle Dnestr (Petrenko 1991).[16] A correlation of the Usatovo-type sites to the chronology of the north Black Sea region is possible through the bone beads in Grave 33 at Sadovoe, which have exact parallels in the group of Chalcolithic graves with skeletons in “extended” position (see Chapter 5).

During the excavations at Cernavoda-Dealul Sofia in 1954–1962, 1967–1968 and 1970, three distinct assemblages (Cernavoda I-III) have been recognized. Based on this evidence, the excavators postulated three consequent chronological phases at the site, with the third phase (Cernavoda III) dating to the Middle Bronze Age (Berciu 1960, 77). Morintz and Roman (1968, 125) were the first to recognize that the evidence demonstrated three unrelated assemblages rather than phases of the same culture. Moreover, they drew attention to the similarity of the material from Cernavoda I and Cernavoda III, and suggested that Cernavoda II was the latest of the three sites (Morintz and Roman 1968, 47). Many traits of the material from Cernavoda III, including vessel shapes, channeled decoration, and figurines, attest that it was closely related to the finds of the Baden-Boleráz period in the Carpathian basin (Roman 2001). In contrast, the comparisons with the material culture of the northwestern Black Sea coast are very weak (see the section in this chapter titled "Usatovo, the Forest-Steppe and the Danube").

Radiocarbon dates are available from very few sites of the Usatovo group. The site of Usatovo itself provided only one dating of a charcoal sample from a grave in the flat cemetery, with a calibrated value of c. 3000 BC (identification unknown; published in Gimbutas 1973, 185). The first charcoal samples from the ditches at Majaki have been analyzed by Semyontsov et al. (1969),[17] Quitta and Kohl (1968) and Gimbutas (1973). New samples from the ditch fill became available after the excavations in 1986 (Videiko and Petrenko 2003, 119; Petrenko and Kovaljukh 2003, 106).[18] The calibrated values of all measurements from Majaki point to the last centuries of the fourth millennium BC. The only radiocarbon dates from graves that can be assigned with any certainty to the Usatovo period have been obtained at Alexandrovka.[19] Samples from the wooden covers of Graves 35 and 22 produced calibrated values in the middle of the fourth millennium (Petrenko and Kovaljukh 2003).

The sites of the Cernavoda III period on the west coast of the Black Sea have not been dated directly by ^{14}C (see Boyadzhiev 1992, 15). Six radiocarbon dates from the Cernavoda I site at Hotnitsa-Vodopada, south of the lower Danube, provide a *terminus post quem* of c. 3600 BC, while the large set of radiocarbon- and dendrodates for the Baden-Boleráz period in the Carpathian basin suggests that Cernavoda III existed between 3600 and 3000 BC (Ilčeva 2001; Maran 1998, 501 f., with references; Wild et al. 2002; see also the summary and updated chronology in Horváth et al. 2008).

HAMLETS, KURGANS AND THE TRANSFORMATION OF THE NEOLITHIC SETTLEMENT TRADITION

Settlement

Information about prehistoric settlements in the region between southern Bug and the Danube delta is very limited. However, one can infer the character of the "missing" habitation sites from the location and size of the kurgan cemeteries, most of which comprised only a few graves.[20] The latter suggests that the settlements were situated in the immediate vicinity of rivers and lakes, had small size and were inhabited only for short periods of time.[21] This instability might have been shaped by the environmental conditions in the dry grasslands between the Danube and Tiligul: the lower moisture in the steppe areas leads to reduced yields of following crops and the need for more frequent changes of cultivated plots and longer fallow periods in comparison to the forest-steppe environments. Thus, the environment limits both the possibilities for long-term habitation and the sizes of the communities.

Some habitation sites occupied defensive positions near the rims of high cliffs and terraces and on hills. Orlovka-Kamennaja gora, for example, is situated on a naturally fortified hill on the left bank of the Danube, controlling the route between Lakes Kartal and Kagul and a major ford over the river (Patokova et al. 1989, 84; Bondar and Petrenko 2005; Bruyako et al. 2005). The major site of Usatovo is situated on the western shore of Lake Khadzhibej near the edge of a high terrace. In many respects, Usatovo was exceptional for the grasslands. The estimated original size of this badly damaged site is c. 6 ha. At the time of investigation, surface finds covered about 4,7 ha (Patokova 1979) (Fig. 6.4).[22] The cultural layer with a depth of 0.50 m suggests a relatively long period of occupation.

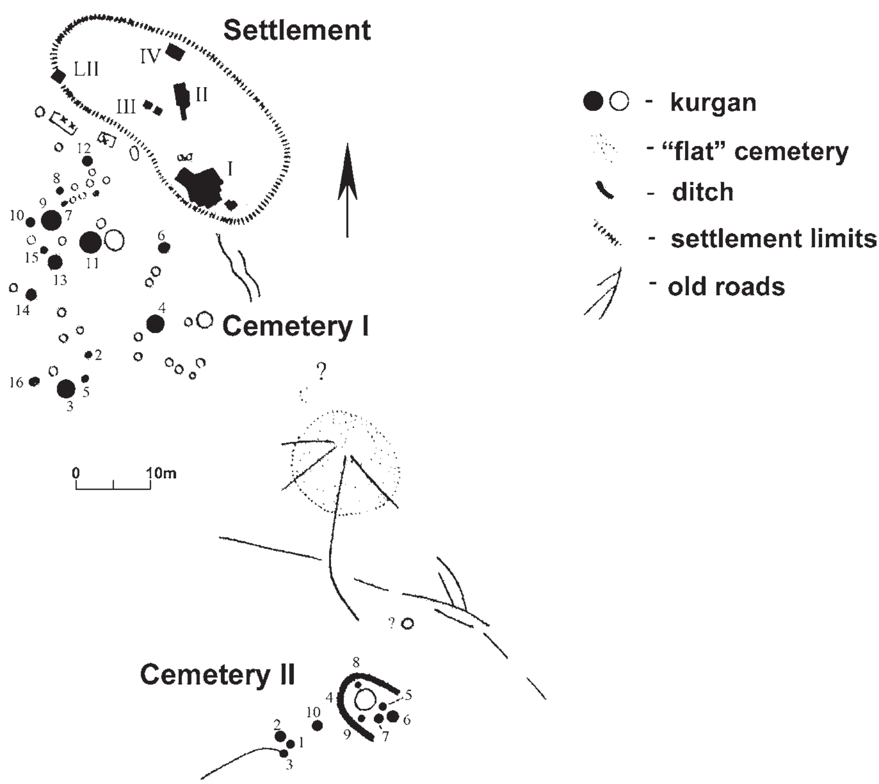

Figure 6.4 Plan of the settlement and cemeteries at Usatovo. After Patokova et al. (1989, Fig. 31).

Stone heaps and pavements in Usatovo have been interpreted as the lower parts of walls and floors of dwellings (Patokova 1979, 15). Remains of three domestic buildings consisting of such stone heaps and platforms were uncovered in Area I in the southeastern periphery of the site during excavations in 1932–1933. The dwellings were situated in a row at a distance of 15–20 m from each other. They had rectangular and Γ-shaped ground plans and a floor area of 35–40 m^2 (Patokova et al. 1989) (Fig. 6.5).

Further stone heaps and several garbage pits were investigated in the centre of Usatovo in Area II (a plan in Patokova et al. 1989, Fig. 31). While the outer fringes of the site were loosely built up, the buildings in this central area were larger and closely packed. One of the structures in Area II was 14 m long and at least 6 m wide. In the same area, excavations revealed puzzling "corridors" (trenches) dug into the limestone bedrock. According to Patokova, the original documentation shows that remains of buildings (i.e. lower parts of stone walls) were situated in the immediate vicinity of the corridors. She interprets the latter as trenches dug to obtain limestone as building material for house walls, similar to the clay trenches on the sides of neolithic Linearbandkeramik houses in central Europe (Patokova

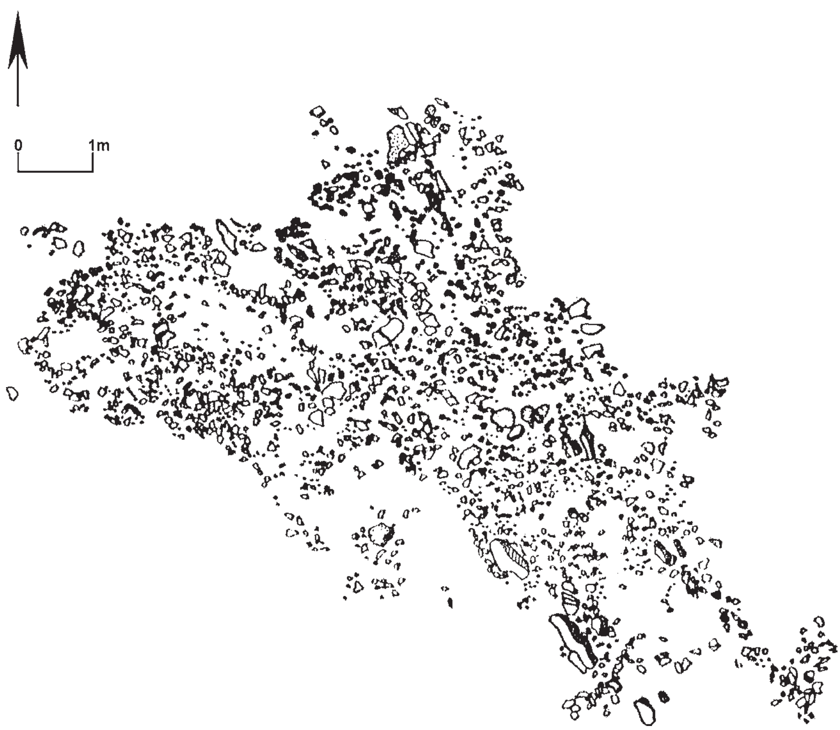

Figure 6.5 Plan of House 1 in Area I at Usatovo. After Patokova et al. (1989, Fig. 31).

et al. 1989, 88). Later, the trenches were used for rubbish deposition. Finally, evidence for houses at Usatovo in the form of a layer of small limestone rubble and a lower part of stonewall came to light in Area III. The interior of this dwelling included a stone platform near the wall and a row of large vessels (Patokova et al. 1989, 88 f.).

The sizes of the dwelling units at Usatovo suggest small domestic groups, unlike the communities of the preceding Tripolie B-C1 period in the forest-steppe zone with their very large houses that possibly accommodated an extended family or a group of related families having separate ovens, storage facilities and household utensils (Bibikov 1965, 52). Structures with special functions, like workshops and communal buildings, have not been reported from Usatovo.

The settlement at Majaki, a second major centre of the late fourth millennium, lay on a 12 m high terrace of Dnestr not far from its estuary. It was enclosed on its landside by several parallel ditches with a V-shaped cross section. The ditches were about 5 m wide and 3–4 m deep (Zbenovich 1974, 23–30, Fig. 8–10; Petrenko and Kovaljukh 2003, 106). The village itself was situated south of the ditches on a promontory that has been completely destroyed by the river. However, the stratification in the ditches documents a long period of continuous occupation. While the lower part of the inner ditch was filled with burned house debris at one operation, the upper part contained a thick deposit of ashy layers that formed over a long period of time. It yielded large numbers of animal bones with traces of burning, pottery sherds, broken clay figurines, debris of stone knapping, and many broken tools of stone and bone (Patokova et al. 1989, 91). Moreover, the fill of the ditches provided large quantities of burned house debris. Imprints of timber and branches showed that the houses at Majaki were built in wattle-and-daub technique like the traditional Tripolie houses in the forest-steppe area (Patokova et al. 1989, 92).

The habitation sites south of the Danube delta are typically situated near coastal lakes, river mouths and confluences, on high riverbanks, and on hills in seasonally flooded areas (Roman 2001; Draganov 1990). The eponymous site of Cernavoda, for example, lies on the summit of a dominating hill at the confluence of a small river in the Danube and had an area of c. 2.5 ha (Fig. 6.2). The habitation layer with a depth of c. 2 m comprises five stratigraphic layers (Roman 2001). The excavators describe buildings with clay floors, wattle-and-daub walls and large size (Berciu et al. 1959, 99–103; Morintz and Roman 1968, 92). However, ground plans or pictures of these structures have not yet been published. Recent rescue excavations at Dragantsi near Karnobat provided evidence for several structures with rectangular ground plans and floor areas of c. 5 x 8 m (Gergova et al. 2010).

Burial Customs

The customary burial habit in the grasslands of the northwest Black Sea was inhumation in an elongated shallow pit. More than 60 per cent of the deceased lay flexed on the left side, usually with arms bent at the elbows and hands laid in front of the face (Patokova et al. 1989, 94) (Figs. 6.6 and Fig.6.7).[23] Painting of the body of the deceased with ochre was an important part of the burial rites. It has been reported for about the half of the graves in the valley of Dnestr and two-thirds of the graves in the Budzhak steppe (Patokova et al. 1989, 97). Frequent remains of organic coverings, coloured patterns on the bones, and strongly flexed positions of the bodies in many graves at Majaki suggest that the deceased were wrapped in a cloth and fastened with coloured (black, violet) stripes of fabric (Patokova et al. 1989, 75). Graves contained usually only one individual, and on rare occasions the skeleton was not in anatomical position. In Kurgan I-5 at Usatovo, for example, the post-cranial bones were found on a heap at some distance from the skull (Patokova 1979, 52). Almost all burials contained objects.

After the burial was completed, the grave pit was usually closed with stone slabs, which in some cases were supported by a wooden frame and posts (e.g. the graves at Tudorovo and Usatovo I-12; Meljukova 1962; Patokova 1979, 69) (Fig. 6.9). In other cases, a large reed mat was placed over the pit and the grave was covered with crossed wooden beams, or the pit was simply filled with earth and stones.[24] A heap of stones often marked the closed grave. Many graves of the Usatovo period were associated with a burial mound. With their average height of 1 m and diameter of 10–20 m, these mounds are smaller than the kurgans of the later Bronze and Iron Ages. Only exceptionally large kurgans reached a height of 3 m and a diameter of 25–30 m.[25] Stone structures, for example circles of stone rubble, are a very common feature of the kurgans. Some stone circles contained standing stone slabs with cup marks and monumental “stelae” with

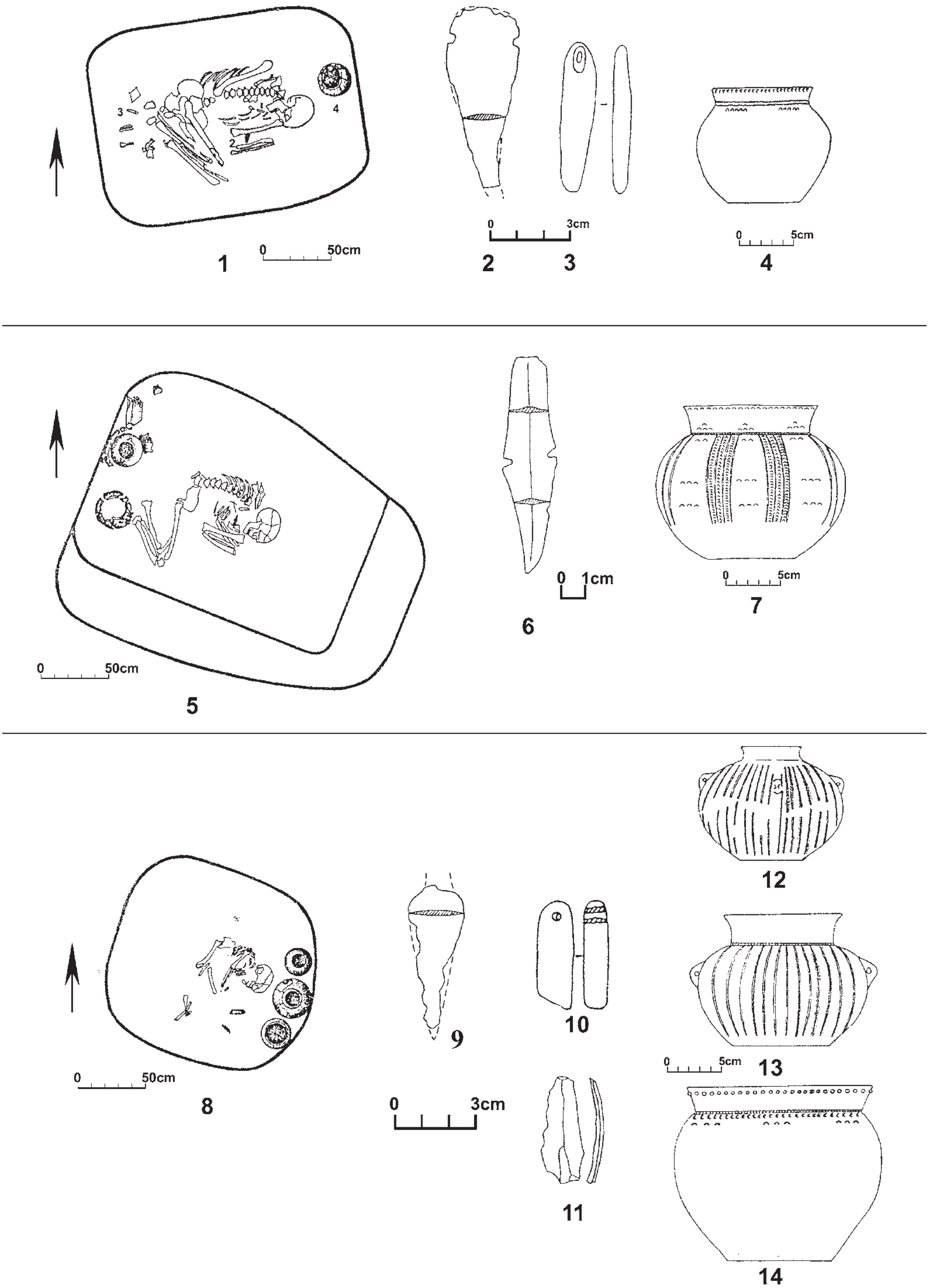

Figure 6.6 Graves with copper daggers at the cemetery of Majaki. Majaki 1/3 (1–4) (after Patokova et al. 1989, Fig. 23), Majaki IV/3 (5–7) (after Patokova et al. 1989, Fig. 24) and Majaki 5/1 (8–14) (after Patokova et al. 1989, Fig. 21). 2.6.9 copper; 3.10 stone; 11 flint; 4.7.12.13.14 pottery.

engraved depictions of humans and animals (Usatovo I-3, I-9, I-11, I-14, II-3; Patokova 1979) (Figs. 6.8 and 6.9).[26] The kurgans at Usatovo and Majaki were arranged in groups of three to twelve monuments, one or two of which were "dominant", that is larger and associated with richly furnished burials (Zinkovskij and Petrenko 1987, Fig. 7; Patokova et al. 1989, Fig. 17). Stratigraphic evidence shows that the central grave was not always the oldest. In some cases the "main" grave was dug and an earthen barrow with a stone ring was erected only after a cycle of burials and other ritual activities had been completed at the site (e.g. Kurgan II-2 in Usatovo; Patokova 1979, 82).

Clusters of graves without kurgans have been investigated only at Usatovo and Majaki. However, the divide between these flat graves and the mound graves was less pronounced than expected. In the first place, both were covered with stone heaps or slabs and associated with upright slabs, pits and hearths (Patokova 1979, 135 f.).[27] Moreover, the fact that many kurgans covered several grave pits dug

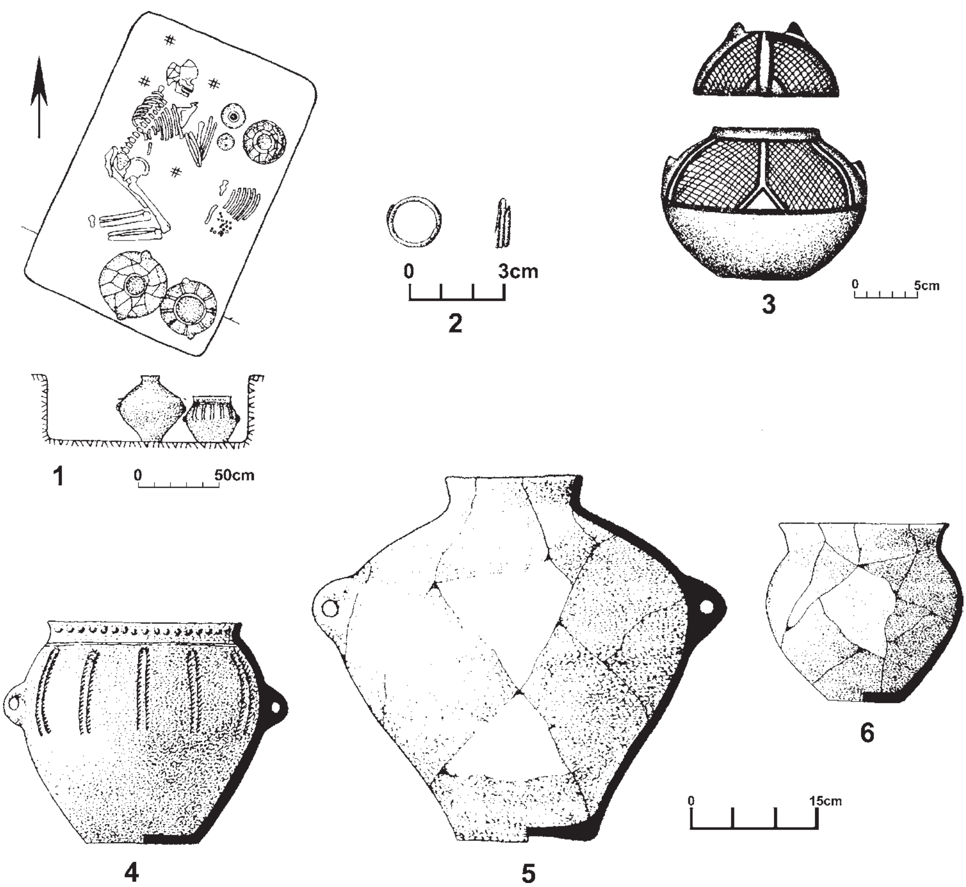

Figure 6.7 The grave of Purkary 2/7. 2 silver; 3.4.5.6 pottery. After Jarovoj (1990, Fig. 41).

from the ancient surface suggests that the construction of a mound often started only after a sequence of flat burials (Patokova et al. 1989, 94).[28]

Both graves in kurgans and flat graves at Usatovo were associated with remains of ceremonial activities. Very common were fireplaces with charcoal, pottery sherds, and burned animal bones (Patokova 1979, 89). A concentration of ashes with a diameter of 50 cm, possibly a fireplace, was uncovered near Grave 16 in Kurgan 1 at Ogorodnoe, while the central grave in the kurgan at Tudorovo was associated with two larger fireplaces with ashes, burned animal bones and sherds of coarse vessels (Subbotin et al. 1970, 136; Meljukova 1962, 77) (Fig. 6.9). More unusual are the so-called "ritual pits". Some of these features seem to contain the remains of burial feasts or to have been used as cooking facilities. For example, two pits with pottery sherds and animal bones, ashes, and stones with traces of soot have been reported from the kurgan at Tudorovo (Meljukova 1962).[29] In Kurgan 1 at Purkary, a pit related to the central burial was filled with the bones of two cows, one horse and one sheep or goat (Jarovoj 1990, 215). It thus seems to contain the remains of a lavish funeral feast, during which at least four costly animals were slaughtered and their meat distributed among the members of a large feasting party. Similarly, pits in the periphery of the kurgan at Sadovoe contained skulls of several large ungulates (Videiko and Burdo 2004b, 284).

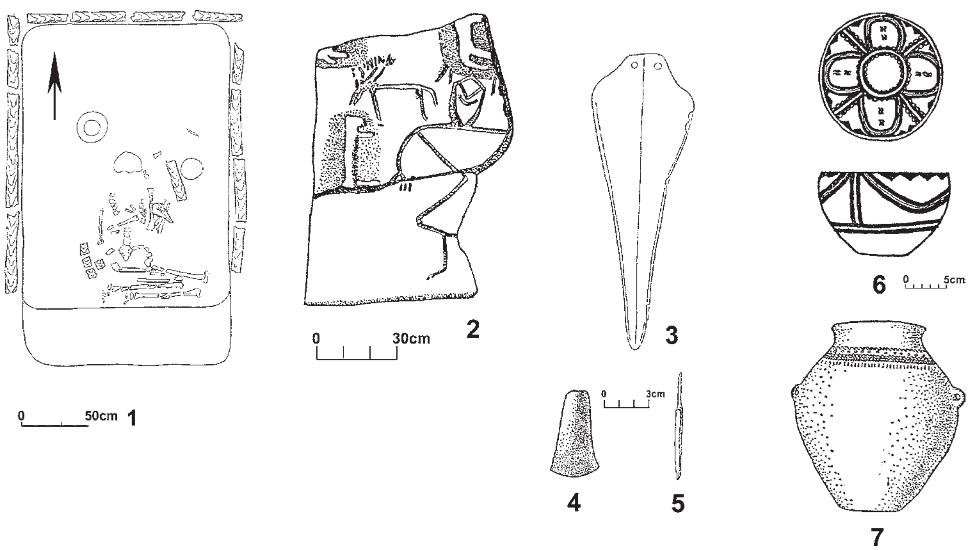

Figure 6.8 The central grave in Kurgan 3 at Usatovo I. 2 stone; 3.4.5 copper; 6.7 pottery. After Zinkovskij and Petrenko (1987, Fig. 8) and Patokova (1979, Fig. 19).

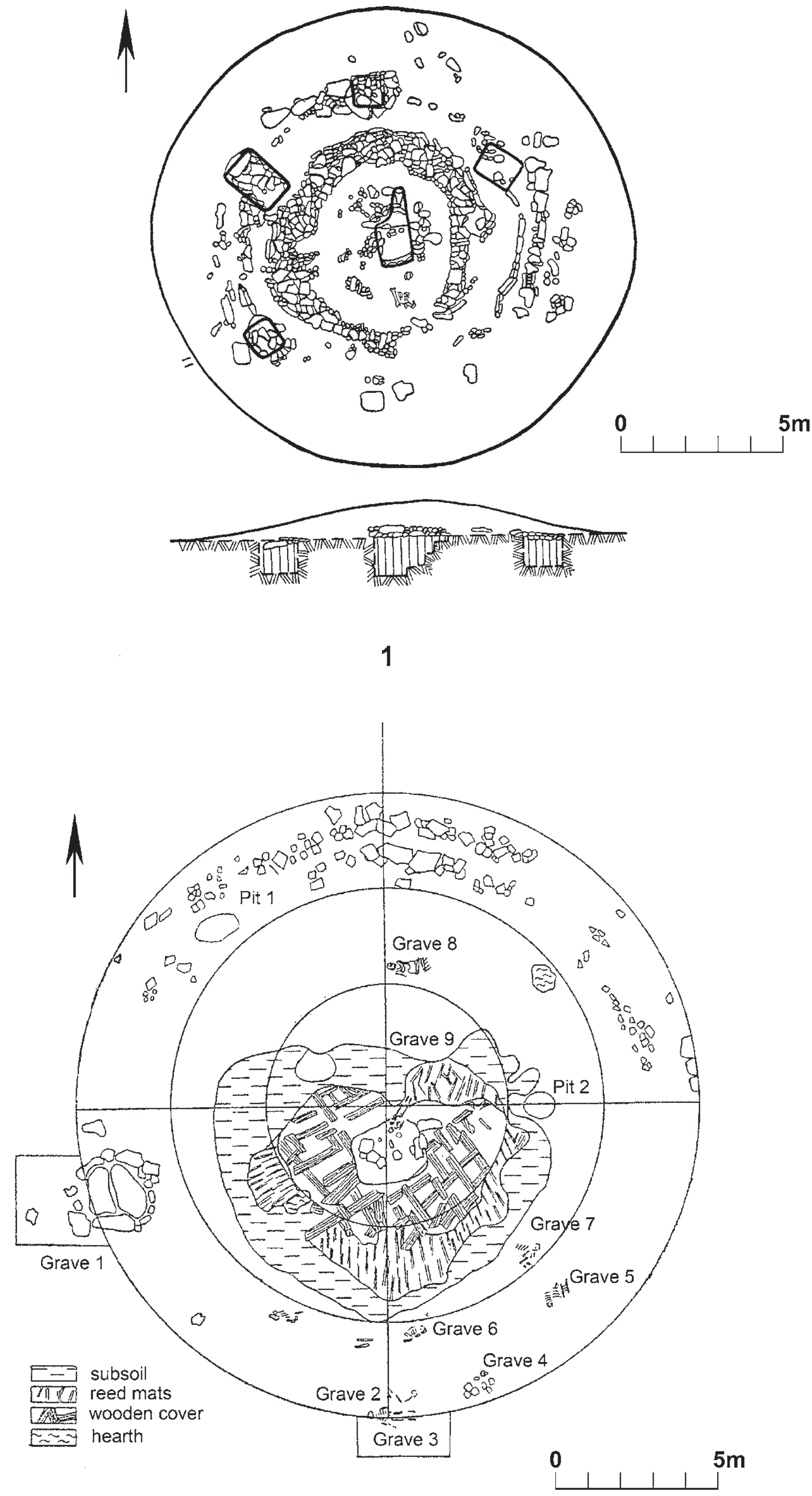

Figure 6.9 Kurgan 2 at Usatovo II (1) (after Masson and Merpert 1982, Pl. LXXXVIII) and Kurgan 1 at Tudorovo (2) (after Meljukova 1962, Fig. 20).

A different type of feature is the "sacrificial pits", situated often under the stone belt of the kurgan. In Usatovo I-11, three pits found under the stone belt were covered with slabs and contained two whole vessels each, while Kurgan II-1 covered a rectangular-shaped shallow pit in which were deposited a broken human figurine and a miniature cup (Patokova 1979, 65, 78). Kurgan II-2 also featured a rectangular-shaped pit containing a piece of ochre, four vessels, four human figurines and five human teeth (Patokova 1979, 81). It remains obscure whether these sacrificial pits were substitutes for graves, graves of infants whose skeletons have completely decomposed, or remains of commemorative feasts.

Another specific feature of the burial practices in the northwest littoral is the presence of animal skeletons. Examples include a complete skeleton of a dog, coloured with ochre, that was uncovered on the ancient surface under the barrow of Tudorovo and two dog skeletons laid under the kurgan at Sadovoe (Meljukova 1962, 77; Videiko and Burdo 2004b, 284). Over the white clay plastered wooden cover of Grave 1/21 at Purkary was found the complete skeleton of a dog too, while inside the grave a whole lamb was placed in front of the deceased (Jarovoj 1990, 62 ff.). The headless skeleton of a sheep was also recovered in the vicinity of a grave at Sarata (Zbenovich 1974, 125). The presence of whole skeletons of sheep and dogs in anatomical positions near or inside the graves suggests ritual sacrifices during the funeral. Moreover, animal bones with traces of ochre hint at the important symbolic role of animal sacrifices and meat consumption. In a large pit with a diameter of 1 m and depth of 0.5 m in Kurgan I-12 at Usatovo, for example, stones with traces of burning and pieces of charcoal were associated with sheep bones coloured with red ochre (Patokova 1979, 70 f.). Similarly, the fill of Grave 8/4 at Majaki contained the bones of a horse, sheep and cattle coloured with red pigment and mixed with pottery sherds (Patokova et al. 1989, 68).

One to seven pottery vessels, usually jars and bowls, have been found in most of the graves. Organic residues indicate that at least some of the pots contained food and drink (see see Jarovoj 1990, Appendix 6). However, apparently not all vessels were laid in the graves as food containers. A painted bowl found in Grave 1 of Kurgan II-2 at Usatovo, for example, was used to keep red mineral pigment (Patokova 1979, 80, Fig. 32, 10). Tools and items of personal decoration, like awls of copper and bone, flint flakes, clay figurines, beads and pendants of bone, animal teeth, and stone, are also very common grave finds. More rare are animal bones, which were deposited possibly as part of a food offering for the dead.[30] Burials with such ordinary furnishings are found in both flat cemeteries and kurgans.[31]

While the majority of the graves seem simple and uniform, several stand out with their atypical construction and unusual finds. Kurgan I-12 at Usatovo, one of the nearest to the settlement site, was surrounded by a circle of rubble stones with a diameter of 11 m. A standing slab with cup marks bordered an interruption in the stone circle. Grave 1, the central grave of the kurgan, was covered with a heap of stones. It contained the contracted skeleton of an adult male individual, several copper objects (flat axe, dagger, awl, chisel), two silver spirals, a sickle with seven flint microlithic inserts, a flint blade, two jars with corded decorations and an amphora and a cup with painted ornaments (Patokova 1979, 66 ff.). The most monumental construction at Usatovo, however, was Kurgan I-11. Its central grave was covered with a huge domed structure of stone with a diameter of 14 m and surrounded with a circle of stone slabs. Three large upright stone slabs with heights of 1.5–2.7 m were situated in the southwest part of the circle, one of them bearing a relief depiction of a dog. The stone belt of the 2.1 m high kurgan measured 42 m in diameter. Sadly, the grave itself was found emptied and contained only several human bones and modern pottery sherds (Patokova 1979, 61 ff.).[32]

Another unusual complex, Grave 1/21 at Purkary, stands out not only with its monumental features but also with its exceptional furnishing. The contracted body was covered with ochre and accompanied by numerous objects. In front of it, as already mentioned, lay the skeleton of a young sheep or goat without a head. Around the body were laid a large piece of ochre, two silver spiral rings, two daggers, a chisel, an axe, an awl of copper, ten sickle inserts in a wooden shaft, some 200 black and white beads of bone and stone (part of a head decoration), a flint blade, an antler hoe, painted vessels (a cup and a jar with a lid), and three large unpainted jars (Figs. 6.10 to 6.12). The grave pit was closed with a double wooden cover plastered with white clay, on which lay the previously mentioned complete skeleton of a dog. A substantial ritual pit associated with the funeral contained the bones of a young horse, two cows, a sheep, several human bones and pottery sherds. On the west side of the burial area were situated four large hearths with a diameter of 2.5 m in association with numerous burned fragments of animal

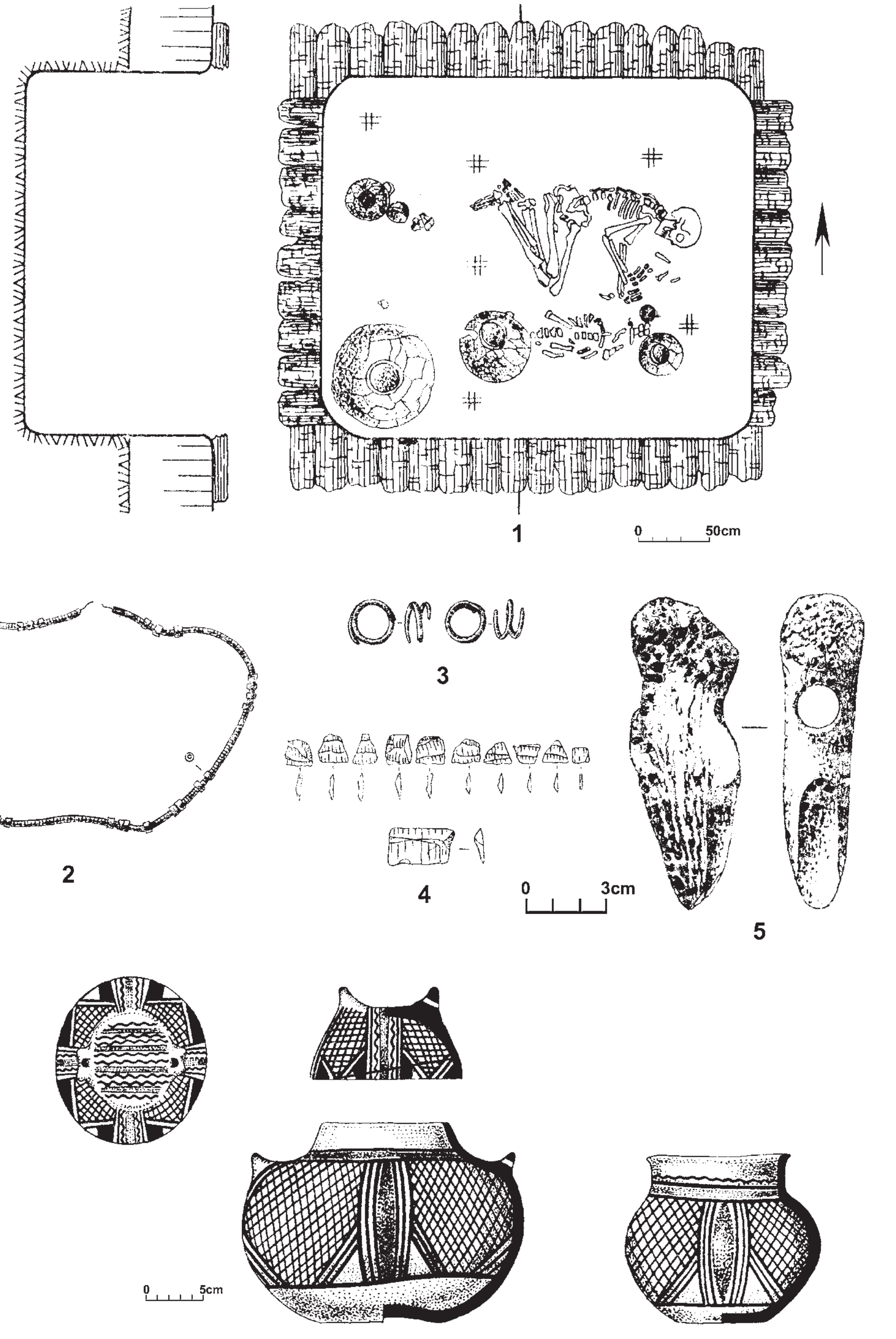

Figure 6.10 The grave of Purkary 1/21. 2 stone and bone; 3 silver; 4 silex; 5 antler; 6.7 pottery. After Jarovoj (1990, Fig. 27 and 28).

bones and pottery sherds. A monumental kurgan with a height of 3 m and a diameter of 40 m was erected over the grave. The kurgan was encircled with a 3 m wide rubble stone revetment (Jarovoj 1990, 62 ff.).

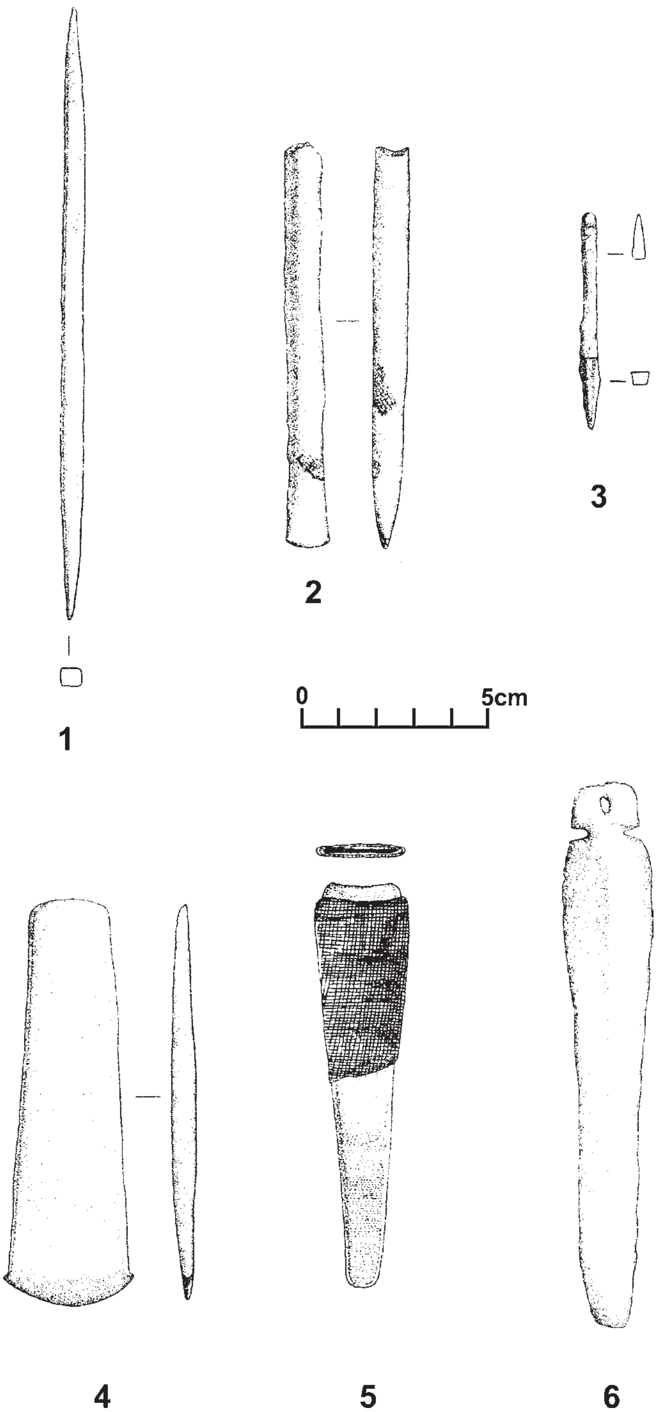

Figure 6.11 Purkary 1/21 (continued), copper tools and weapons.

South of the Danube, graves dating to the second half of the fourth millennium have been revealed at Durankulak. Seventeen later graves came to light during excavations in a large cemetery of the late sixth and the fifth millennia BC. According to the excavators, the graves were associated with small and badly damaged burial mounds (Todorova 2002, 50; Vajsov 2002, 159–176). One of them (Grave 1126) was encircled with stone rubble, while another (Grave 982) contained a Usatovo-type copper dagger (Todorova 2002, 50) (Fig. 6.13).[33] Manzura (2005b) has correctly pointed out that most of these finds, with the exception of Grave 982, may predate the Usatovo period.

In summary, small communities inhabiting short-lived, shifting hamlets near the lakes and rivers seem to have predominated during the Usatovo period. This pattern sets Usatovo apart from the other late Tripolie groups and was possibly dictated by the specific ecological conditions of the dry grasslands. The settling of Russian farmers in the Volga-Manych steppes to the west of the Caspian Sea during the nineteenth century, while clearly anachronistic, can provide some valuable insights into the nature of farming colonization in a dry steppe environment. The farmers lived in compounds of one or two farms (*khutor*), which never developed into villages. New compounds constantly sprang up and the old waned in a process of settling that was hardly regulated by the government (Otchir-Goriaeva 2002, 119). A settlement form like this would barely leave a trace in

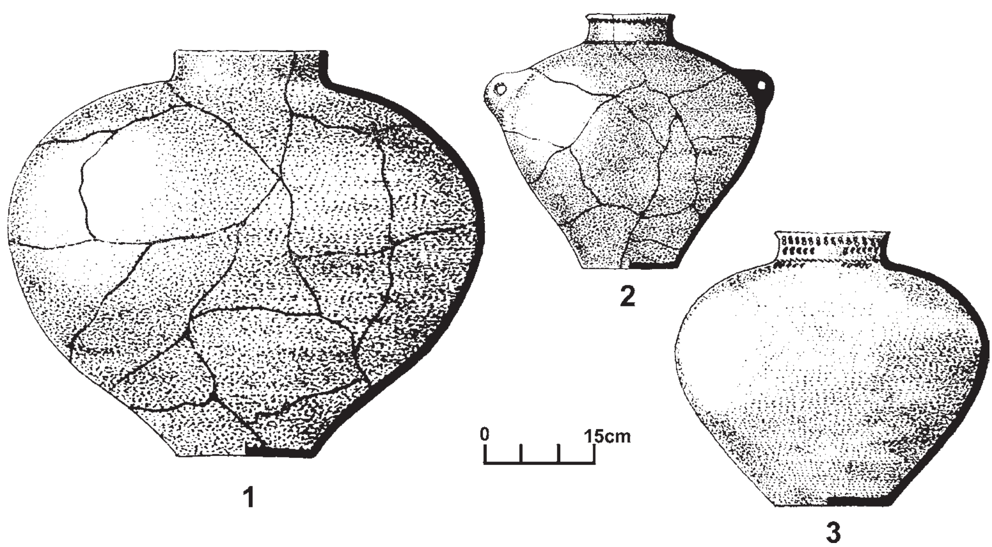

Figure 6.12 Purkary 1/21 (continued), large ceramic jars.

the archaeological record. Surprisingly, nucleated villages with long habitations and large sizes developed in prehistory in at least two cases. The cemetery areas of Usatovo consisted of more than 350 graves, while the settlement at Majaki was associated with a graveyard of some 100 graves (Patokova et al. 1989, 79, 92). It is important to stress that large settlements and cemeteries did not appear in this region in the preceding or in the following periods. Usatovo clearly represents a central community, whose exceptional role is reflected in series of large kurgans containing outstanding finds.

A noteworthy aspect of the mortuary evidence in the northwest part of the Black Sea is the importance of funerary feasts. Hosting a feast creates social obligations and among numerous feasting occasions, funerals are particularly often manipulated to reaffirm and extend lineage power (Hayden 2009, 34–36). Hayden (2009, 32) describes the practices of funeral feasting among the Akha as follows: "Among the Akha, who are relatively low on the scale of complexity and inequalities, funeral attendances range from 20 people to over a thousand; there may be 20 to over 700 serving vessels and the number of animals slaughtered range from a modest-sized pig up to five water buffaloes and several pigs. At more lavish funerals, there are also some gifts (silver to ritual specialists, meat to lineage supporters) and copious alcohol (Clarke 1998, 115, 135). In contrast to these richer funerals, the poor provide only enough food necessary for those who make the coffin and prepare the body. However, in general, families try to hold the largest funeral feasts that they possibly can".

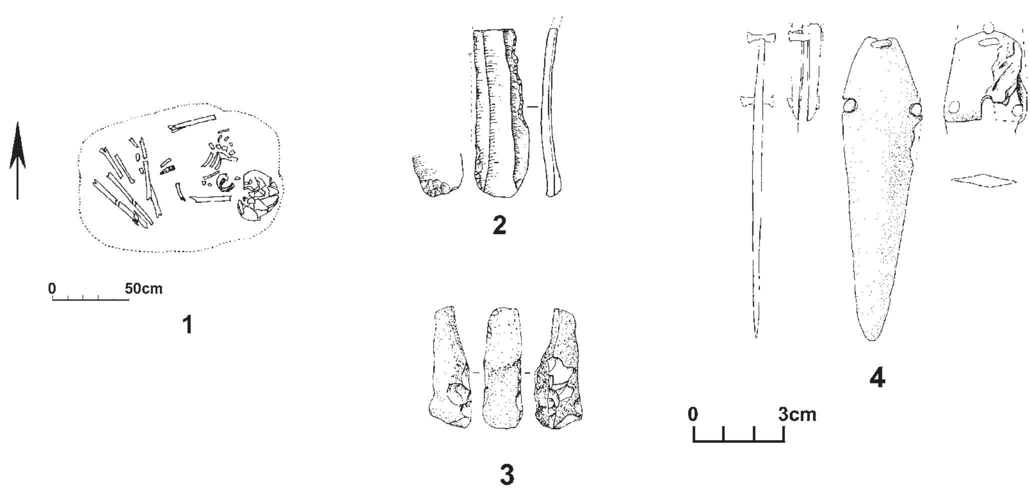

Figure 6.13 Grave 982 at Durankulak. 2.4 flint; 3 copper and bone. After Todorova et al. (2002, Fig. 178).

Crop Cultivation, Animal Husbandry and Exploitation of Wild Resources

The annual precipitation in the coastal region northwest of the Black Sea is sufficient for rainfed farming. Colonists in the area between the Danube and Dnestr rivers in the first half of the nineteenth century successfully cultivated grain crops and produced surplus for export (Brandes 1993, 230–233). However, due to high rates of erosion and evaporation and severe unpredictable droughts, the region remained a marginal environment for grain cultivation until the construction of modern large-scale irrigation systems during the Soviet era.[34] Agricultural communities that penetrated into the grasslands from the southwest and northwest in the course of the fifth and fourth millennia BC probably faced the need to adapt their farming practices to the arid environment. Archaeobotanical evidence shows that steppe farmers apparently cultivated the same array of crops as the inhabitants of the forest-steppe (see Janushevich et al. 1993). However, more frequent rotations of cultivated plots, longer fallow periods and a change in the relative importance of certain crops, with an emphasis on drought-resistant species such as millet and emmer, may have become necessary after the expansion of traditional crop husbandry into the coastal grasslands.

The botanical evidence from sites of the Usatovo group consists mainly of imprints of grains and chaff on pottery and wall plaster. Botanical macrorests have not yet been reported.[35] The study of grain and chaff imprints from Usatovo and Majaki has recognized grains of emmer, bread wheat, naked six-row barley, millet, peas, bitter vetch and possibly oats (Patokova et al. 1989, 118).[36] Moreover, einkorn has been reported from Majaki (Kuzminova and Petrenko 1989). The list of plant species identified in graves at Purkary includes einkorn, emmer, bread wheat, barley, millet, oats, peas, and several weed species and wild plants (Jarovoj 1990, 259 f.).[37]

Thus, the traditional combination of hulled and naked wheats, barley and pulses of southwest Asian origin was also cultivated by the farmers in the dry grasslands of the coastal region.[38] In addition, they were familiar with one central Asian short-day plant, broomcorn millet (*Panicum miliaceum*) (Pashkevich 1997, 266; Kuzminova and Petrenko 1989, 119).[39] This cereal plant apparently has been grown in the region to the west of the Black Sea since the early fifth millennium BC and remained a major cultigen during the Bronze Age (Marinova 2006, 77; Jarovoj 1990, 89).[40] Millet is resistant to drought and seasonal aridity, tolerates poor soils and heat, and has a very short growing season. The identification of seed impressions of a second plant of central Asian origin, hemp (*Cannabis sativa L.*), has been claimed for sites of the Tripolie B period in the forest-steppe area (Janushevich et al. 1993, Fig. 4).[41] Although such finds have not yet been reported for Usatovo sites, hemp might have been familiar to the inhabitants of this area.

Soil breaking, furrowing or dibbling with hand hoes, consisting of an antler working part and a wooden handle, was practiced both in the forest-steppe and in the grasslands (Fig. 6.14).[42] Small antler hoes were found in graves at Purkary 1/21, Usatovo II-1, and Majaki 4/1, 3/7, while dozens of antler hoe fragments originate from the habitation sites at Usatovo and Majaki (Jarovoj 1990, Fig. 27, 7; Patokova 1979, 105, Fig. 31, 6; Patokova et al. 1989, Fig. 19, 13, Fig. 20, 13; Zbenovich 1974, 60 f., 64). The initial length of the antler parts measured up to 25–30 cm (Zbenovich 1974, 64). Microwear analyses of comparable antler hoes from Tripolie sites suggest that these tools were indeed used for soil tillage, while experiments demonstrated that they are twice as effective as a simple digging stick (Korobkova 1975).

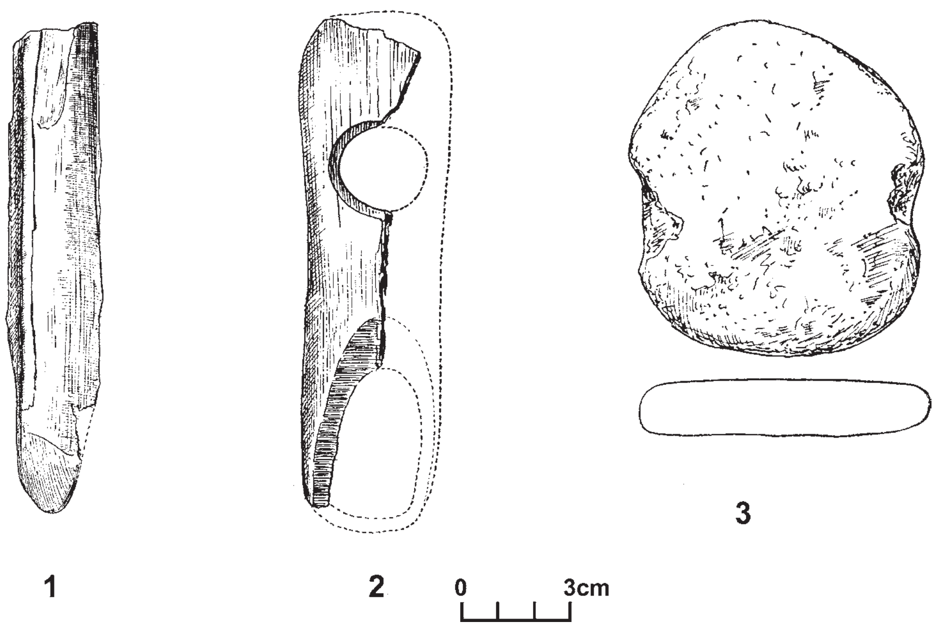

Figure 6.14 Antler hoes and stone net sinker from the settlement at Majaki (1–2) (after Zbenovich 1974, Fig. 25, 7) and Usatovo (3) (after Zbenovich 1974, Fig. 24, 18).

Another well-represented tool was the sickle. The farmers of the Usatovo period used a unique sickle form consisting of a wooden handle and inserts of trapezoid flint microliths.[43] Nine microlithic inserts of this type were found together with an antler hoe among the grave goods at Purkary 1/21 (Fig. 6.10, 4). Microwear analysis of the latter find revealed that the inserts were used for cutting grasses (Jarovoj 1990, 217; Petrenko et al. 1994, 43).[44]

The river banks and lake shores along the western Black Sea coast, with their reed beds, damp forests, and wetland meadows, provide ample resources for grazing domestic animals in the dry season along with hunting, fishing, and gathering. Faunal remains indicate that the farmers of the Usatovo period kept cattle, sheep and goats, but not pigs. Sheep bones significantly predominate in numbers in the faunal assemblages from Usatovo and Majaki (Patokova 1979, Table 4; Patokova et al. 1989, Table 8). Nevertheless, cattle still overweighed the small ruminants as a supplier of meat and might have provided 40–60 per cent of the mammal meat consumed at these sites (Patokova 1979, Table 4). A few pig bones have been reported from Usatovo, although Patokova et al. (1989, 120) consider them intrusive from a later habitation layer. In the large faunal assemblage from Majaki, consisting of more than 10.000 bones, there was not a single pig bone (Zbenovich 1971). Thus, the animal husbandry of Usatovo stands out among all other late Tripolie groups, which kept mainly cattle but grew pigs as a second most important source of meat (Tsalkin 1970, Appendix 4–5; Kruts 2002).

The prevalence of small ruminants and the absence of pigs in the faunal assemblages from Usatovo and Majaki have been interpreted as an adaptation of the farming system to a grassland environment and even as an indication for a specialized mobile pastoral economy. However, the relationship between pig rearing and pastoral lifestyle is not straightforward. Raising pigs is an issue of fodder supply, and thus primarily related to environment rather than economy. Ethnographic examples demonstrate that in environments with oak forests, where it is possible to keep foraging animals, pigs are numerous and can even be moved seasonally to remote forested areas. In contrast, settled farmers in the grasslands keep only a few pigs, since pigs do not eat grass and can hardly feed in a steppe environment (Otchir-Goriaeva 2002, 125). Furthermore, the rejection of pigs also can be a cultural choice. It appears that the absence of pig rearing in Usatovo was compensated through higher numbers of small ruminants, while the proportion of cattle remained comparable to that in the forest-steppe zone.

A further issue raised by the faunal assemblages at Majaki and Usatovo is the development of specialized exploitation of living animals as a source of food and power. More than 60 per cent of the small ruminants and 45 per cent of the cattle were culled before reaching maturity (Patokova et al. 1989, 122 f.). This age distribution hints that the animals were kept for meat, and cattle possibly also for milk and traction. The practice of milking cattle during the Tripolie C1 period is suggested by the find of a clay figurine of a cow with an udder from the site at Majdanetskoe on the middle Dnepr (Videiko and Burdo 2004a, 192), while the painted decoration on the back of a clay bovid figurine from Usatovo may represent the saddle of a pack animal (Gusev 1998, 16 f., Fig. 2, 3).[45] The high number of horse bones and the association of horse bones with the bones of domestic animals in funerary contexts (see the section titled "Burial Customs" in this chapter) indicate a special attitude toward this animal. However, the exact form of horse exploitation in Usatovo remains elusive, since direct archaeozoological evidence for its domestic status is not available.

In the faunal assemblage from Cernavoda III-Dealul Sofia, the number of cattle bones outweighed only slightly the bones of small ruminants (Susi 2001, Table 1). In contrast to Usatovo, 10 per cent of the bones belonged to pigs, mostly young and sub-adult individuals. About 60 per cent of the cattle and 40 per cent of the small ruminants were slaughtered before reaching full maturity (Susi 2001, 65, Table 4). There is no archaeozoological evidence for woolly sheep at sites of the Cernavoda III period, though their presence has been inferred for the early Baden culture in the Carpathian basin. The faunal data from the latter region demonstrate a change to a breed of bigger sheep at the transition to the Baden period (Bökönyi 1979, 103 f.). Similar observations at sites in a large region between central Europe and Greece, dating to c. 3500–3000 BC, suggest according to Benecke the spread of a new sheep race, possibly a woolly sheep of Near Eastern origin (Benecke 1994, 138; see also Chapter 8).

Imprints of seeds on pottery vessels and wall plaster show that the communities dwelling near the rivers and lakes gathered wild apples, pears, and walnuts (Kuzminova and Petrenko 1989). The inhabitants of Usatovo hunted horses, wild ass and red deer (Fig. 6.15).[46] In the assemblage from Majaki, large ungulates, mainly wild ass (*Equus hydruntinus*) and red deer predominated, while bones of

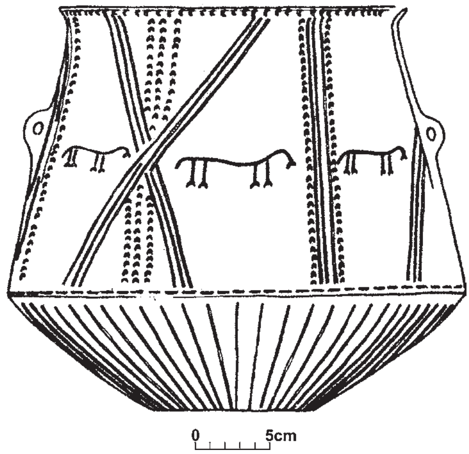

Figure 6.15 Ceramic vessel with depictions of horses from Grave 1/1 at Tudorovo. Reproduced with permission by I. Manzura from Dergachev and Manzura (1991, Fig. 52, 6).

aurochs and wild boar were comparatively rare (Zbenovich 1971). At first sight, hunting appears unimportant in comparison to animal husbandry, since the number of wild animal bones is very low (in Usatovo less than 10% of all animal bones).[47] However, as Patokova et al. (1989, 122) aptly stress, most of the bones belonged to very large wild animals that provided abundant quantities of meat (e.g. a wild ass may weigh more than 300 kg) and the meat obtained by hunting was, in fact, comparable in quantity to sheep meat.[48]

Aquatic foods played a central role in the diet of some communities living near the western Black Sea coast. An enormous quantity of fish bones and scales was found in the ditches at Majaki. Fish remains represent 20 per cent of all osteological finds from this site, and the quantity of fish meat in Majaki was comparable to the quantity of meat obtained from wild animals or sheep (Zbenovich 1971; Patokova et al. 1989, 123). Several large migratory species inhabit the river mouths and estuaries of the northwest Black Sea coast. Especially numerous are sturgeons feeding in brackish waters and migrating upstream in spring for spawning. Surprisingly, the migratory species of the sturgeon and cyprinid families (sturgeon, *Acipenser spp.*, sterlet, *Acipenser ruthenus*, and Black Sea roach, *Rutilus frisii*) together made up only 15 per cent of the fish bone assemblage at Majaki. Most numerous was catfish (*Silurus*), a species of large fishes living in shallow coastal waters and in the rivers, with 65.7 per cent. The individuals caught ranged in length between 40 and 270 cm. Perch (*Sander*), a fish species which inhabits coastal waters and estuaries and reaches 85 cm in length, made up 13.9 per cent of the fish bone assemblage. Fresh water species like the common carp (*Cyprinus carpio*), roach and asp were the least common with 4.8 per cent (Zbenovich 1974, Table 4). In summary, the inhabitants of Majaki fished mainly in the estuary of Dnestr and in the river itself year-round for fat-rich large species like catfish, perch and carp. The seasonal catches of migratory sturgeon and roach were of secondary importance. Conspicuous is the absence of small schooling salt-water species like the sprat and anchovy and of large pelagic schooling fish like tuna, bonito and mackerel. The species composition strongly suggests that sea fishing was not practiced by the community at Majaki.[49]

Fishing tools are numerous at Usatovo and Majaki (Patokova et al. 1989, 98 ff.). Angling is demonstrated by the finds of bone hooks in different sizes (Zbenovich 1974, 116). Some of the bone hooks, for example the 4.7 cm long specimen form Kurgan II-3 at Usatovo, were used for angling very large fish (Patokova 1979, Fig. 34, 10). The use of netting as a fishing technology can be inferred from a bone tool found in Kurgan I-6 that showed traces of use as a needle for net knotting (Patokova 1979, 104, Fig. 20, 9). Moreover, flat stone sinkers for nets make more than 4 per cent of all stone tools found at Usatovo (Berezanska et al. 1994, 13) (Fig. 6.14, 3). Since the methods of capturing depend on fish behaviour, ethnographic data can provide some insights into the association of fishing tools and certain fish species (Belcher 1994, 131). Carps are generally captured by netting, while catfish are procured by both netting and angling (Belcher 1994, Table 10.2). For exploiting large concentrations like migratory fish, teams of fishers can close the access to the lagoon after spring shoals entered it on their way upstream to spawn, and harvest the fish upon returning in autumn (Rose 1994, 53, 105).

The ditch at Majaki and the cultural layer at Usatovo provided abundant evidence for the consumption of molluscs (Zbenovich 1974, 30; Patokova 1979, 20). The identified species inhabit fresh (*Unio*), brackish (*Monodacna colorata*), and salt-water (*Cardium edule, Mytilus galloprovincialis*) environments (Zbenovich 1974, 116). Shellfish gathering by wading and hand collecting in baskets is very productive in nutrient-rich habitats like estuaries and shallow lakes (Waselkov 1987, 96). Ethnographic accounts of shell-gathering expeditions describe the practice of extracting and drying the meat near the sea, though there is also evidence of processing fresh shellfish in settlements situated up to 10 km from the seashore (Waselkov 1987, 115).[50]

In summary, village societies on the west coast of the Black Sea practiced a traditional southeast European form of mixed farming based on hand tillage; cultivation of hardy, drought tolerant crops (emmer, barley, and millet); and breeding of ruminants for meat and possibly for milk. Since the risk of crop failure in the arid steppe environment of the northwestern coast was somewhat higher in comparison to the forest-steppe, the prevailing interpretation regards animal herding, even a form of specialized "remote pasturing", as the economic basis of the Usatovo communities (Zbenovich 1974, 111–117; Petrenko 1989, 118–124; Rassamakin 2007, 454; Manzura 2005a, 332 – "a pastoral culture of herding type"). Indeed, environmental conditions in the coastal zone offered a possibility for differential uses of pastures, for example for grazing the flocks during the rainy season in the grassland on the watersheds and during the dry season on the wet river meadows. However, the development of a specialised pastoral economy during the Usatovo period remains an unproved hypothesis.

As Moreno García (1999, 172) has pointed out for the practice of transhumance, the presence of complementary ecological zones is not a sufficient condition for extension of the pastoral sector. Rather, the economic context determines the development of specialized pasturing strategies. In a subsistence economy, excess animals would be culled before winter. Building large flocks, with its concomitant problems of winter stall-feeding and seasonal change of pastures, is not economically sensible if the animals are kept mainly for immediate subsistence needs, which was most probably the case during the Usatovo period.[51] The higher portion of sheep among the domestic species in comparison to the forest-steppe zone is also not a convincing argument in favour of specialized (mobile) pastoralism. On one hand, the emphasis on sheep breeding was possibly an environmental and not economic adaptation, since sheep are less demanding than cattle in terms of food, water and climate (Khazanov 1994, 49 f.). Moreover, the higher numbers of small ruminants apparently compensated for the absence of pigs. It seems probable that the inhabitants of the coastland buffered subsistence risks by intensive exploitation of wild resources, especially in riverine and coastal environments, rather than by transhumant pastoralism. At least half of the meat in their diet was obtained from fat fish and large wild ungulates.

Storage of Staple Foods and Food Preparation Habits

Staple foods at the site of Usatovo were stored in large ceramic containers inside the houses. Along the walls of a house in Area III, for example, were uncovered the lower parts of pithoi with heights of c. 100 cm and a largest diameter of 80 cm (Patokova et al. 1989, 88 f.; Zbenovich 1974, 83). Moreover, in Area LII in the northwestern periphery of the site Lagodovskaja excavated ten round pits with vertical walls, with diameters of 90–130 cm and depths of 70–100 cm, some of which contained household garbage while others were filled with sterile soil and stones (Patokova et al. 1989, 89). Given their regular shape and uniform size, the pits might have been initially dug for grain storage. Ethnographic data demonstrate that straw-lined pits provide cheap, secure and simple means for long-term storage of cereals (Adejumo and Raji 2007).

Hulled cereals like emmer and millet, the principal staples cultivated during the Usatovo period, are traditionally stored as husked spikelets. The lengthy pounding, winnowing and grinding of the husked grain before consumption are performed on a daily basis (D'Andrea 2003; Sigaut 1996, 418 f.). Emmer grains, the main wheat variety consumed during the Usatovo period, can be cracked in a wooden mortar or ground to flour in a stone saddle quern. Yet, the latter tool was only rarely found at Usatovo and Majaki (Patokova et al. 1989, 90, 119), a situation that may reflect a preference for gruel rather than bread. The main use of emmer in historical times was indeed for porridge, while millet was commonly consumed as a gruel, a thin cereal meal made by boiling flour in water or milk (Thurmond 2006, 20). Two jars and a painted amphora with a lid from Purkary 1/21 and 2/13 contained charred grains of millet, durum/bread wheat and residues of some form of cereal pulp or flour, respectively (see Jarovoj 1990, Appendix 6). With their narrow necks, both vessels are suitable for liquids, so that the residues may represent two different cereal meals, a thin porridge and a gruel.

A large outdoor area with facilities for fish processing has been reported from Majaki (Zbenovich 1971; 1974, 25). In one of the ditches at this site, up to 40 cm thick layers of ashes and numerous oval depressions with lengths of 2.5–5.5 m, filled with charcoal, burned animal bones, and pottery sherds, were investigated. All fireplaces contained plentiful remains of fish. The unusual concentration of fish bones and scales suggests that the main purpose of these facilities was the cleaning, smoking and drying of large catfish and sturgeons on a seasonal basis, probably in spring or autumn.

Weaving Crafts

In contrast to other late Tripolie groups, the settlements and graves of the Usatovo group provided very few clay spindle whorls. Most whorls from coastland sites have biconical shapes and resemble closely the whorls of the forest-steppe Tripolie communities (Masson and Merpert 1982, Pl. LXXXIII).[52] Disc-shaped whorls with diameters of 5–6 cm, manufactured from pottery sherds, have been reported from the settlement at Usatovo (Patokova et al. 1979, 42 f.).

Loom weights were common in the settlements of the late Tripolie period, and the warp-weighted loom seems to have been the principal weaving implement in use (e.g. Brinzeni III and Kosteshti IV; Kosakivskij 2003, 63). Moreover, the find of eighty-two conical clay weights in situ at Starye Badrazhi on the middle Prut (Masson and Merpert 1982, 220) suggests the manufacturing of textiles on a loom with several heddles. Finds of loom weights were not recovered from Usatovo and Majaki, but imprints of textiles and actual textile remains demonstrate the use of looms at these sites (Patokova 1979, Fig. 11; Zbenovich 1974, 82, Fig. 30, 1; Jarovoj 1990, Fig. 27, 2). Imprints of coarse textiles on the bottoms of pots are very frequent and originated from materials with a variety of textures, for example mats manufactured in different variants of the twined technique and coarse cloth, rugs and mats woven on the loom in plain and rep techniques.

Lithic Technologies

Deposits of high-quality flint are not available in the region between the lower course of southern Bug and the Danube. The communities of the Usatovo period used small nodules of opaque grey and black flint of poor quality that they collected in the riverbeds. Large quantities of production debris (thousands of flakes) and some twenty cores of local raw materials have been reported for the ditch filling of Majaki (Zbenovich 1971, 195). The techniques of stone knapping were simple and required little skill. Expedient core technology, the detachment of irregular flakes from unprepared cores by direct percussion, was the most common technique used at Usatovo and Majaki (Patokova 1979, 22; Patokova et al. 1989, 98) (Fig. 6.16). Small conical and prismatic prepared cores for microblades also have been reported (Zbenovich 1974, 56) (Fig. 6.16, 18).[53]

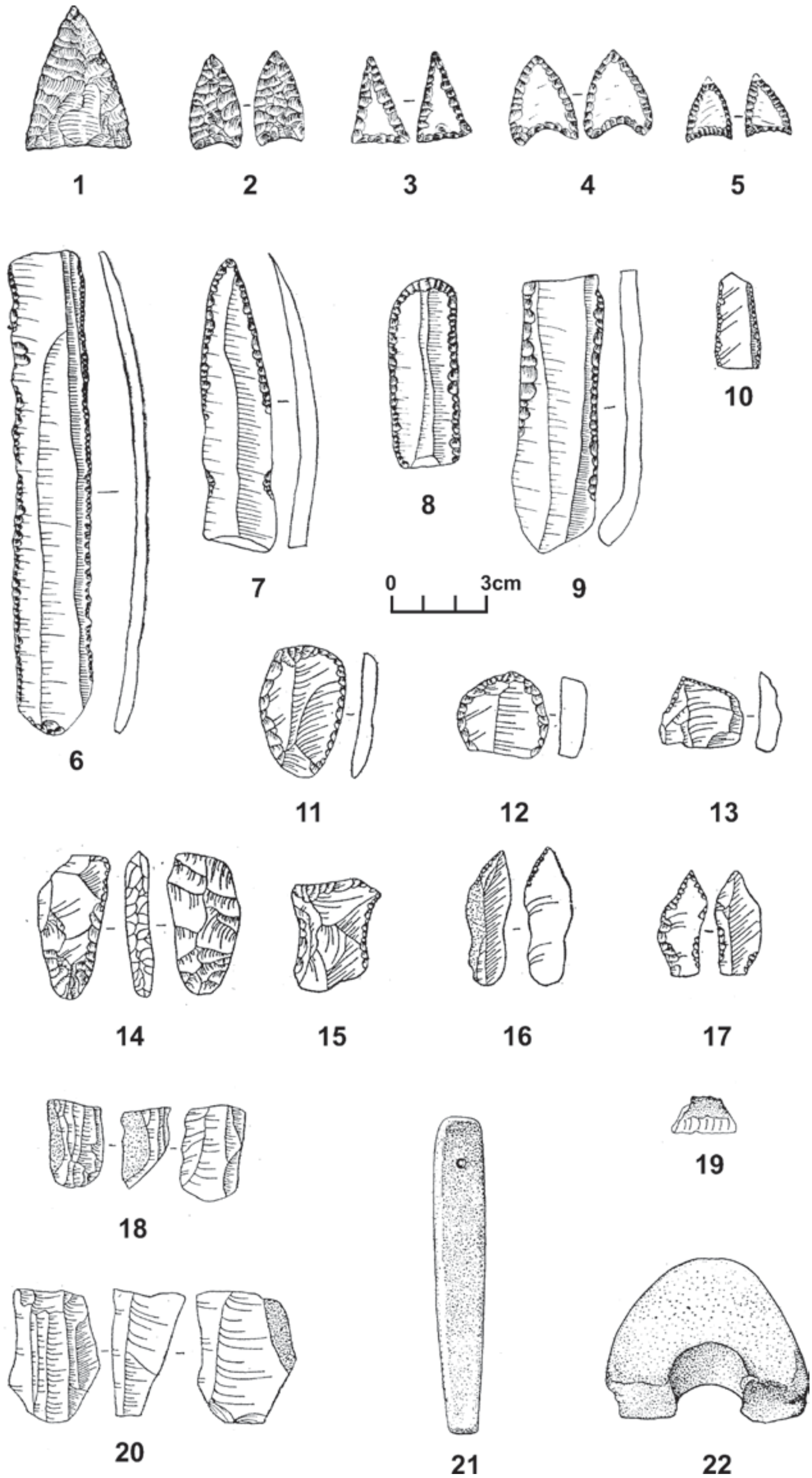

Figure 6.16 Flint and stone artefacts from the settlement at Usatovo (1–4, 5–10, 12–18, 21, 22), the flat cemetery at Usatovo (5) (after Zbenovich 1974, Fig. 24) and graves at Majaki III/5 (11) (after Patokova et al. 1989, Fig. 23, 15); Sukleja, Kurgan 3 (19) (after Zbenovich 1974, Fig. 24, 17) and Tudorovo, Kurgan 17 (20) (after Zbenovich 1974, Fig. 24, 16).

Tools on high-quality, long regular blades occur very infrequently (Zbenovich 1974, 56; Berezanska et al. 1994) (Fig. 6.16, 6–9). The raw material for these blades was imported from the middle Dnestr and the region of Volyn and the technique of detaching was much more elaborate than the common knapping practices described previously. Most probably, the communities of the coastal region obtained the regular long blades as ready-made products through exchanges with their northwestern neighbours (Patokova et al. 1989, 98).

The intensive exploitation of the primary and secondary sources of excellent flint on the middle Dnestr and in Volyn began during the mid-Tripolie period (Chernysh 1967).[54] The most valued variety was the "chalk-flint", a highest quality translucent material with dark grey colour and white spots. Large nodules of this raw material occur in enormous quantities in Volyn and are very easy to obtain, either by collecting nodules in the rivers or by quarrying just below the surface (Berezanska et al. 1994, 10). The pre-forming of the cores took place near the quarries, while the knapping was performed in specialized workshops (Berezanska et al. 1994, 11 f.; Skakun 2006). During the middle/late Tripolie period, the inhabitants of the middle Dnestr and Volyn achieved a very high level of knapping skills. The detachment of long regular blades from large conical cores up to 25 cm in length by pressure debitage with a crutch or lever represents an apogee of flint working, and the products of this specialized activity were traded over long distances (Videiko and Burdo 2004a, 265). The production of series of long blades for exchange and specialization are intrinsic for this technology (see Clark 1987). Caches of imported long blades without traces of use have been found under house floors at several late Tripolie sites between Bug and Dnepr (Kushtan and Pichkur 2006).[55] The hoarding of these artefacts suggests that they were difficult to obtain and exceptionally valuable. Imports show that the coastal communities at Usatovo and Majaki were involved in this system of specialized production and supply, though caches have not yet been reported from the coastal region.

The paucity of ground stone tools implies that stone working declined during the later fourth millennium BC. Artefacts of ground stone are generally rare in the settlements and nearly absent in the graves. Bead making persisted in this period, but the range of materials and shapes was limited to small cylindrical and disc-shaped beads of agate, anthracite, jet and limestone with black and white colour (Patokova et al. 1989, 101 f.). Necklaces and head decoration of alternating black and white cylindrical beads originate from Purkary 1/21 and 2/5, Usatovo I-11 and Grave 34 at Alexandrovka (Jarovoj 1990, 64, 91, Fig. 27, 6 and Fig. 40, 5; Patokova 1979, Fig. 24, 5; Videiko and Burdo 2004a, 390). Colourful stone beads have not been reported from Usatovo contexts.

Pottery

The most common clay body used by the Usatovo potters contained crushed shells and sand (Zbenovich 1974, 79). Since high calcite content can cause serious difficulties during firing, the ubiquity of shells appears surprising. However, as Feathers (2006, 111) has demonstrated, vessels made of shell fabrics are significantly more resistant to breakage in comparison to quartz-tempered pots, since shell admixtures greatly suppress the propagation of cracks. This advantage may, at least partly, explain the preferable use of shell-tempered pots by the Usatovo communities. Used considerably less frequently in the Usatovo period was a very fine clay without any opening materials.[56] Analyses of the chemical composition of pottery vessels from Usatovo, two of them of painted fine ware, suggest that all vessels were manufactured from the same, most probably local, clay (Patokova 1979, 26).

Visual inspection of the pottery from the settlement of Usatovo suggests that it was hand-shaped by coiling and joining separate parts – rim, belly and bottom (Patokova 1979, 26). Evidence for hand shaping was furthermore provided by petrographic analyses of coarse pottery from Ghelăeşti and Tîrgu Ocna-Podei, two sites of the Cucuteni B period belonging to a synchronous and related pottery tradition in the region between Prut and the Carpathians (Ellis 1984). Since the orientation of the particles in the tangential thin sections published by Ellis (1987, Fig. 6, 1) is random, these vessels were most likely shaped by slab building (cf. Courty and Roux 1995, Table 1). The frequent occurrences of textile impressions on the bottoms of coarse vessels at sites of the Usatovo group (Zbenovich 1974, 98) hint at the practice of shaping a pot from bottom to top while turning it on a mat.

It has been suggested that the fine pottery of the middle/late Tripolie period was finished or even thrown on the potter's wheel. A sandstone slab with two depressions, one of which showed traces of rotary motion, has been reported from Varvarovka XV, a settlement of the Tripolie C1 period in the region between Dnestr and upper Prut (Ellis 1984, 115; 1987, Fig. 7.1, with references). However, it is not certain whether the slab was used for the shaping of pottery. Microfabric studies conducted by Ellis on fine pottery from Ghelăeoti and Tîrgu Ocna-Podei provided evidence for a diagonal linear alignment of mica particles in thin sections of the vessel wall, interpreted by the author as the consequence of considerable mechanical pressure applied to the clay mass during the shaping process. Ellis believes that the vessels were manufactured with "some sort of turntable or simple wheel" (Ellis 1987 179, Fig. 6). Gibson and Woods (1997, 219) also mention the diagonal orientation of elongated particles, for example mica laths, as evidence of wheel-throwing (in contrast to coil-building, which causes horizontal alignment of the particles). It seems, thus, that coarse and fine pottery was shaped by different methods. However, it is not possible to extrapolate this scarce data to the technology of pottery-making in the whole Tripolie area. The use of the potter's wheel during the Tripolie period can be clarified only through a programme of systematic microfabric studies.

Many vessels of the Usatovo group were decorated. Most pots had dark burnished surfaces and ornamental motives stamped with a stick, a toothed tool, or impressed with a cord (Patokova 1979, 27 f.). The finer vessels with polished black surfaces were decorated with delicate cord impressions filled with white paste (Patokova 1979, 29) (Fig. 6.17).[57] The intense and even black surfaces of some finer pots

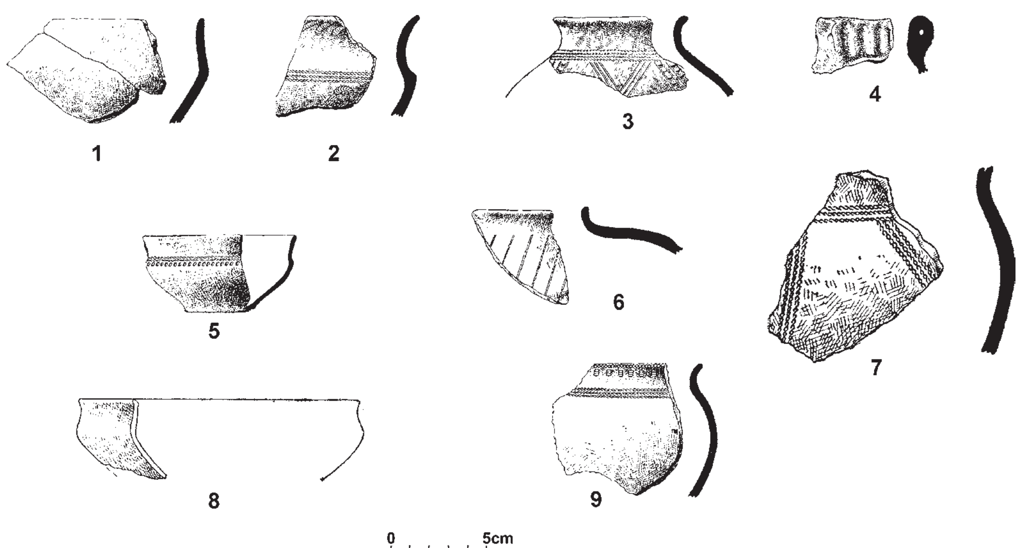

Figure 6.17 Fine table ware from the settlement site at Majaki. After Zbenovich (1974, Fig. 36).

were probably achieved by intentional smudging, the deposition of carbon on the vessel surface. Smudging takes place by restricting the air supply at the end of the firing, for example by smothering with dung, sawdust, or grass (Gibson and Woods 1997, 251).[58]

A small proportion of the fine vessels had painted ornaments. Painted decorations gradually disappeared in southeast Europe after the close of the fifth millennium BC, and the late Tripolie groups, including Usatovo, were among the last to maintain this tradition (Fig. 6.18).[59] The technology of monochrome black and bichrome black-and-red painting employed by the Usatovo potters has not been yet studied. The technique of black painting that has been most widely used in the Old World since the sixth millennium, the so-called "iron-reduction technique", employs paint slips of ferruginous clays or ochres. The black colour of the ornament is obtained by a three-step process of firing the pots in oxidizing conditions, a short reduction at the end of the firing during which the vessel surfaces attain a dark colour, and subsequent re-oxidation after removing the pots from the fire. During the final re-oxidation, the unpainted surface of the vessel quickly recovers its light colour, while the more compacted painted areas remain dark (Noll et al. 1975, 602).[60] By applying paint in layers of varying thicknesses, the potter can create bichrome red-black motives (Noll et al. 1975, 610). However, there are some indications that a different, less complicated method of black and black-and-red painting had been practiced in the Tripolie area. Ellis has documented the presence of hausmannite (Mn_3O_4) in the black paint on sherds from sites of the Cucuteni B period between the Prut and the Carpathians (Ellis 1980, 228).[61] This compound is an indication of the use of "manganese black", a clay paint slip containing manganese minerals that turns black when fired in an oxidizing atmosphere and thus makes the steps of reduction and re-oxidation unnecessary.[62] Moreover, the use of the manganese black technique ensures a reliable final black colour, while iron reduction can produce any shade between brown and black. The potter can prepare manganese paint by enriching a clay slip with ground manganese-containing minerals, or, if available, use natural manganese-rich earths (Noll et al. 1975, Table 1). It is important to stress that "manganese black" differs profoundly in terms of raw materials, firing conditions and technical sequence from the iron-reduction technique.

The potters of the Usatovo period must have fired the majority of their products in open fires. The mottled surface, characteristic of the

Usatovo pottery, is an indication of firing under changing conditions. The preferential use of crushed shells as an opening material also speaks for open firing. Shells consist of calcium carbonate ($CaCO_3$), which decomposes into lime, or calcium oxide (CaO), at temperatures above c. 600°C. If lime does not re-combine with other materials into stable compounds, for example high-temperature calcium alumino-silicates (glazes), it absorbs water after firing, expands and causes spalling of the ceramic body ("lime blowing") (Feathers 2006, 92). Fabrics with shell admixtures therefore normally will not be fired at high temperatures in kilns. Potters can diminish the risk of spalling

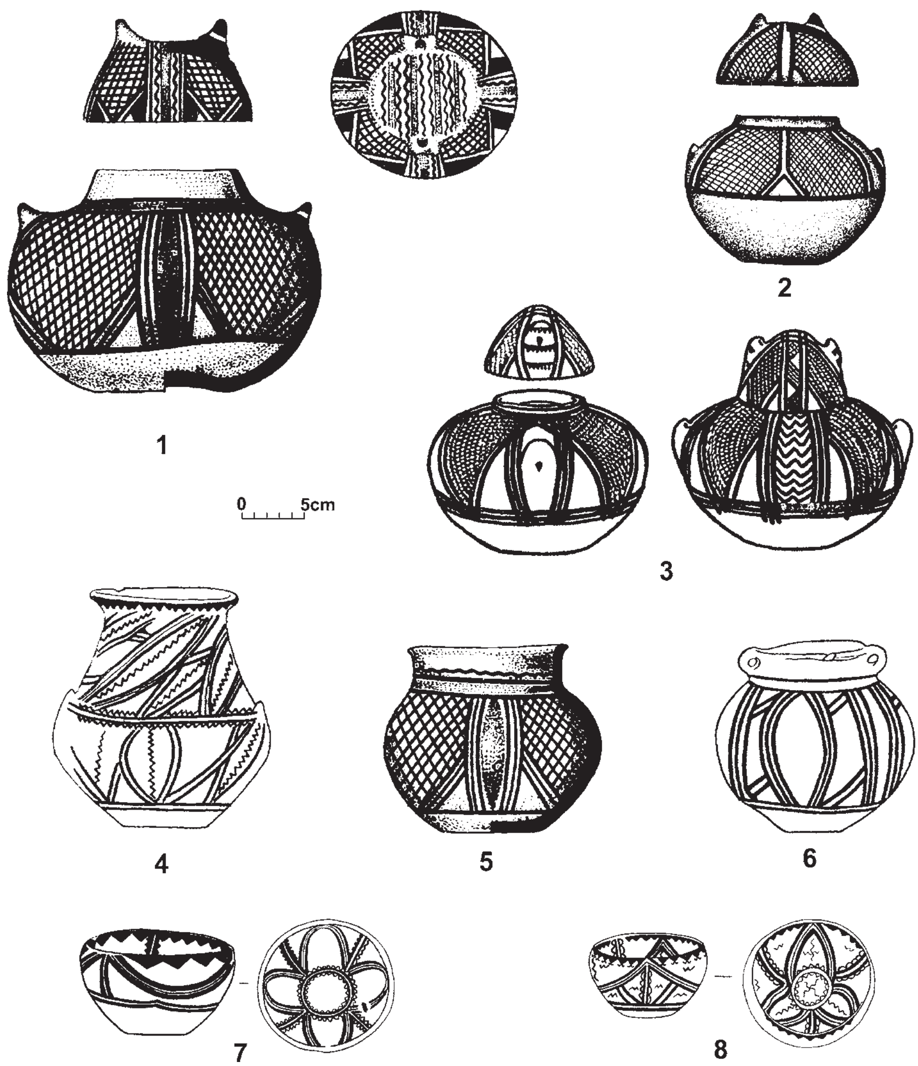

Figure 6.18 Painted table ware from the graves at Purkary 1/21 (1.5) (after Jarovoj 1990, Fig. 28), Purkary 2/7 (2) (after Jarovoj 1990, Fig. 41), Bolgrad, Kurgan 6 (3) (after Subbotin and Shmaglij 1970, Fig. 10, 4), Usatovo I-11 (4), Usatovo II-2 (6), Usatovo I-3 (7) and Usatovo II-1 (8) (after Zbenovich 1974, Fig. 34).

and even rise the firing temperature to 800°C if they restrict the air flow during firing, since the accumulation of carbon dioxide slows down the decomposition of calcium carbonate (Feathers 2006, 119). This practice might offer an explanation for the typical dark brown or grey-brown colour of the Usatovo shell-tempered ware.

Certainly, not all ceramic wares of Usatovo were produced in open fires. The hard-fired "clinking" walls and even buff or pale orange surface colour of some very fine vessels speak for high control of firing conditions which can only be achieved in a potter's kiln (Patokova 1979, 26). Well-preserved kilns have not been reported from the Usatovo area, but the clay slabs with perforations from the ditch at Majaki may represent fragments of the grates of two-chamber updraught pottery kilns (Patokova et al. 1989, 91). Similar kilns were common in the Cucuteni-Tripolie area from the second half of the fifth millennium onwards (Comşa 1976).[63] Updraught kilns of this type are no more efficient than open fires in terms of time, average temperature and fuel (Gosselain 1992, 246, Fig. 1; Pool 2000, 71 f.). However, kiln firing is the technique of choice if reliable manipulation of temperature and atmosphere is essential for the quality of the final product. This was certainly the case for the exquisite painted vessels of the late Tripolie period, whose fine clay bodies were vulnerable to rapid temperature fluctuations and might easily shatter, while the elaborately decorated surfaces can be spoiled by uncontrolled changes of the firing atmosphere.[64]

In summary, the main ceramic ware of the Usatovo period was manufactured from a coarse clay body with inclusions of sand and crushed shells. The vessels had thick walls, smooth surfaces, and were fired at low temperatures to grey and brown colours. A second ware included vessels of clay with less inclusions of crushed shells and finer mineral admixtures, thinner walls, burnished surfaces with dark or even deep black colour, and very good firing (for an overview see Zbenovich 1974; Patokova 1979, 26) (Fig. 6.17). Jars with rounded bodies predominate among the hollow shapes of these two wares; jugs with vertical handles for pouring liquids are also present (Zbenovich 1974, Fig. 31 and 32). Flat vessels include rounded bowls and cups with several different shapes, for example wide open bowls with S-profiles and beakers with cylindrical upper parts (Zbenovich 1974, Fig. 33, 1–7, 10–13). Componential pottery is limited to lugs for hanging or for fastening a lid, small vertical handles for lifting and carrying, and single vertical handles starting under the rim of pouring vessels (Dergachev 1980, Fig. 29, 28; Maljukevich and Petrenko 1993, Fig. 5a). Spouts, legs, pedestals, or high bases are absent. More than 90 per cent of all sherds belonged to these two "shell" wares.

A third ware used by the communities of the Usatovo period includes fine painted table ceramics (Fig. 6.18). The vessels were shaped from levigated clay, their walls were relatively thin, hard-fired and completely oxidized, with slipped and burnished reddish-brown or beige surfaces and black or black-and-red painted decorations (Zbenovich 1974, Fig. 34 and 35). It is not clear whether this ware was manufactured in the coastal settlements or imported from the middle Dnestr. The apparent use of the same clay sources for preparing both the characteristic local "shell fabric" and the fine clay body (see Patokova 1979, 26) speaks for the local production of painted vessels. Moreover, four seated human figurines of local types from Kurgan II-2, Pit 6 at Usatovo have been reported to consist of the same clay as the painted ceramics (Patokova et al. 1979, 107). The painted motives and designs at Usatovo are identical to those found on the middle Dnestr, although some details are characteristic only for Usatovo (e.g. painted vessels with four legs) and the proportions of the different designs diverge (Dergachev 1980, 106). The shapes of the fine painted ware were basically limited to two vessel types, jars and bowls. Hollow shapes include several varieties of spherical rounded jars with wide, low necks, for example jars with two vertical handles on the widest part of the body or just under the rim, or jars with two small vertically pierced lugs on the shoulders and a lid ("Late Tripolie amphorae") (Zbenovich 1974, Fig. 34, 1–11). The only example of a flat shape is the simple rounded open bowl/cup (Zbenovich 1974, Fig. 34, 12.14–15).[65] Componential pottery is represented by special lids, lugs for hanging and for fastening a lid, handles for lifting and carrying, and vessels with four legs (e.g. at Majaki 2/5 and Parkany Kurgan 91; Patokova et al. 1989, Fig. 21, 14; Zbenovich 1974, Fig. 34, 9). The fine painted ceramics are represented with only about 5–10 per cent of all sherds in the ceramic assemblages.[66] They were the sophisticated and standardized products of several complex technologies of shaping, decorating and firing. It is important to stress that kiln-fired painted ceramics were very costly in terms of both craftsmanship and of material and time investments (including the costs for fuel and maintenance of the installations, experience in constructing and operating the kilns, and long operation times).

The pottery of type Cernavoda III to the south of the Danube was manufactured from two basic clay bodies – coarse shell-tempered clay and fine clay with mineral filler (Roman 2001). The common pottery of the Cernavoda III period was ornamented with incised, impressed and plastic motives and resembles the coarse vessels of Usatovo (though here the motives impressed with a cord are infrequent and simple) (Manzura 2002, 2003). The fine pottery, however, complies to a very different aesthetic. Painted pottery is absent, and the plain fluted and burnished dark surfaces of the vessels hint at the imitation of metal (Morintz and Roman 1968, Fig. 37).[67] Componential pottery is generally infrequent, with some vessels displaying wide vertical ribbon handles attached to the rim, small vertical handles on the widest part of the body, and tunnel lugs under the rim (Morintz and Roman 1968, Fig. 32, 1–6, 9.11, Fig. 36, 6.9, Fig. 37, 15). Jars with high cylindrical necks, hole mouth jars ("Sackgefäße") and jars with rounded bodies and two handles on the widest part ("amphorae") characterize the inventory of hollow shapes (Manzura 2003, Fig. 7). The flat shapes include, apart from simple conical and rounded bowls and cups, a characteristic type of bowl with a hemispherical body, cylindrical neck and out-turned rim (Manzura 2003, Fig. 7, 11.1–2, 12.1, 13.1–2).

Faience

Faience artefacts have been reported from three sites of the Usatovo group. At the site of Usatovo itself, two graves provided finds of small pear-shaped faience beads. One of the beads, from the fill of Grave 1 in Kurgan II-2 excavated in 1936, is c. 6 mm long and 9 mm wide and opaque white in colour. The second find, a translucent bead with a diameter of 7.5 mm and rose colour, came to light during the excavation of Kurgan II-8 in 1984 (Ostroverkhov and Petrenko 1990; Patokova et al. 1989, 102). Spectral analyses of beads from Usatovo, conducted by Ostroverkhov, confirmed that they were manufactured from a synthetic material. The white bead from Usatovo II-2 was coloured by phosphorus, obtained possibly from ground bone (Ostroverkhov 1985, 2005; Ostroverkhov and Petrenko 1990). It has been further reported that Grave 2/16 at Ternovka contained 150 beads of "white paste" (Agulnikov and Savva 2004, 199 ff.) and the head of the child buried in Grave 34 at Alexandrovka was decorated with "paste beads" (Videiko and Burdo 2004b, 390).[68] However, these identifications of "paste" have not been confirmed by material studies. In all cases, it remains unclear whether the beads were produced locally or imported from distant regions, for example from the north Caucasus.

There are some indications that other late Tripolie groups also used faience. The finds of faience beads in the late Tripolie cemetery at Sofievka on the middle Dnepr came from the surface and might originate from the Bronze Age or Iron Age deposits (cf., Ostroverkhov 1985). The beads from Ketroshika on the middle Dnestr, in contrast, can be dated with certainty to the second half of the fourth millennium, since they were found inside a painted late Tripolie jar. This chance find consisted of seventy-three tiny beads of white paste (diameter 2–3 mm, 1–1.5 mm thick) and 196 beads of stag teeth and bone (Ostroverkhov and Petrenko 1990; Ostroverkhov 2005).[69] Unfortunately, the identification of the material from Ketroshika as faience has not been confirmed by material studies.

Transport

The evidence for use of vehicles at Tripolie sites is restricted to the forest-steppe zone and dates to the first half of the fourth millennium BC. Small clay vessels on "skis" with protrusions shaped like animal heads are frequent finds in the settlements of the Tripolie B2 and C1 phase. More than fifty finds have been reported alone from the Bug–Dnestr area (Gusev 1998, Fig. 4). There is little doubt that these clay objects represent animal-drawn sleds consisting of a box, a frame, wooden runners and a shaft-draught system for hitching a single animal. One plausible function of such simple sledges is short-distance transport – similar vehicles are a very common means of transportation in village societies (Starkey 1989). Less obvious is their interpretation as threshing sledges, since ethnographic examples do not display runners. However, as observed by Anderson et al. (2004, 104) during experiments, runners raising the frame from the hard threshing floor may noticeably facilitate threshing with a sledge frame armed with large flint blades. The threshing sledge is a very ancient farming tool and its use may even go back to the eighth millennium BC (Anderson 1994, 2003). Use-wear on flint artefacts hints at the use of threshing sledges in the coastal area of the west Black Sea since the late sixth millennium BC (Skakun 1994; see also Gurova 2001).[70] The clay models of sledges disappear after the middle phase of Tripolie. Comparable artefacts do not occur in Usatovo or any other late Tripolie group.

Another peculiar type of clay object from the Middle Tripolie period in the forest-steppe is the vessels in the form of bovids with horizontally pierced legs (e.g. Videiko and Burdo 2004b, 194).[71] The holes in the legs are assumed to have held wooden axles but, while plausible, such a reconstruction has not been substantiated by complete figures with wheels. Moreover, identical animal vessels also occur without perforations on the legs (e.g. Videiko and Burdo 2004b, 192). These finds suggest that the communities of the mid Tripolie period were familiar with the principle of wheel and axle. It is tempting to assume that this familiarity, in combination with the knowledge of animal-drawn sledges, might have led to the development of a wheeled vehicle in the area between the middle courses of Dnestr and Dnepr. As Maran (2004b, 437 f.) has pointed out, animal-draught transport and especially the heavy wagon would have been crucial for the sustenance of the enormous concentrations of people at the "mega-sites" of the Tripolie C1 period in the forest-steppe. Yet, the Tripolie wheeled objects never have the shape of a wagon. Moreover, an essential precondition for the emergence of the heavy four-wheeled wooden wagon must have been the familiarity with an appropriate system of traction – the paired pole-and-yoke draught system.[72] Evidence for the paired draught system with pole and yoke has not yet been reported for Tripolie contexts, while the (wheeled) animal-shaped vessels have always only one animal head. Thus, the interpretation of these objects as models of two-axled oxen wagons remains debatable. Like the sledge models, the wheeled animal figures disappeared after the middle Tripolie period. Late Tripolie has provided neither remains of actual wagons nor their representations.[73]

Domestic Architecture

Only free-standing, above-ground buildings have been reported from the site of Usatovo. The structures had simple rectangular and Γ-shaped ground plans (Fig. 6.5). The buildings at Usatovo were constructed from stone and possibly mud. Postholes have not been observed. The lower part of their stone foundations was dug into the bedrock (Patokova et al. 1989, 86). Similar construction has been observed at late Tripolie sites in the forest-steppe, for example at

Zhvanets-Shchobv on the upper Dnestr (Patokova et al. 1989, 92). According to Patokova et al. (1989, 92), the extensive use of stone at Usatovo was determined by the geological conditions at the site, situated in an area of high-quality limestone (it was in fact badly damaged by a modern limestone quarry), where good building material is readily available just under the surface.

At Majaki, a construction of wattle-and-daub was apparently widely used. Large amounts of substantial, up to 40 cm long, burned wall fragments with impressions of stakes have been recovered from the ditches. The house walls must have consisted of daub mixed with straw and attached to 15–20 cm thick stakes (Patokova et al. 1989, 90 ff.). Since the architectural evidence from Majaki originates exclusively from the ditches, the use of larger wooden posts cannot be confirmed. Wattle-and-daub architecture is common for the sites of the late Tripolie and Cernavoda III groups (Patokova et al. 1989, 92).

COPPER METALLURGY AND METALWORK

Mining and Smelting of Ores

It is difficult to discuss the provenance of metal at fourth-millennium BC sites in the west Black Sea in the absence of analytical data. Copper ores occur in the Strandzha Mountains on the southwest coast. During the late fifth millennium BC, metal from these deposits predominated in the cemeteries along the Bulgarian coast. It reached northwards as far as Durankulak, possibly along a maritime route (Todorova 2002, 127–158, map 5; Gale et al. 2000, 116–118; Pernicka et al. 1997, 132, Fig. 27). There are some indications that the supply from these deposits persisted well into the fourth millennium, since the isotopic composition of the dagger from Grave 982 at Durankulak matches the Strandzha copper ores (Grouplet 1, Pernicka et al. 1997, 105, Table 3).

All metals found in the grasslands along the lower courses of the Danube, Dnestr and southern Bug must have been imported, since this region is devoid of metal deposits. The nearest copper deposits are located on the upper Dnestr (e.g. Ivano-Zolote; Klochko et al. 1999); further rich deposits of copper are situated in the northern part of the eastern Carpathians in the upper courses of the Rivers Moldova, Bistriţa and Olt (Ryndina 1998, 31; Dergachev 1998, 27 f.).[74]

Mining and smelting of copper ores began in the Balkans in the late sixth millennium BC (Gale et al. 2003, 156–159, Table 10.1; Borić

2009).[75] The chemical composition of fifth-millennium artefacts and residues on crucibles from the eastern Balkans hints at the practice of smelting mixed charges of copper oxides and sulphides (Ryndina et al. 1999).[76] By the middle of the fifth millennium, smelting might have spread into the Tripolie area east of the Carpathians. A formless piece of metal from the site of Nezvisko (Tripolie B1) on the upper Dnestr could possibly represent a smelting ingot of unrefined copper (Ryndina 1962, 87 f.).

The exact technology of smelting during the fifth and fourth millennia BC in the eastern Balkans remains difficult to grasp. Copper minerals and possible smelting vessels and installations have been found at several fifth-millennium habitation sites in the Balkans.[77] A "pit furnace" has been reported from the mid-fifth-millennium stratum of the settlement mound at Durankulak. The installation uncovered in House 4–10 of Level VI was described as a plastered pit with a diameter of 70 cm and a depth of 45 cm, surrounded by a 25 cm high clay border. The pit showed traces of strong fire and contained burned material, including a piece of bone with a copper prill attached to it and a clay object interpreted as tuyere (Todorova 1999, 242, Fig. 7.1).[78] Another possible smelting hearth associated with slag residues, copper prills, oxide and sulphide ores, and charcoal has been recovered in a Chalcolithic house by rescue excavations during the construction of a hospital in the town of Stara Zagora (Kalčhev 1992).[79] Recent investigations provided interesting new evidence for smelting at a late-fifth-millennium settlement situated at Akladi Cheiri, in the northwest part of the bay of Sozopol, not far from the Strandzha copper deposits. Ore pieces of azurite and malachite, slagged clay vessels with copper prills, hearths, a crucible, and copper awls have been recovered at this site (Leshtakov et al. 2009; Leshtakov and Klasnakov 2010, Fig. 2).[80]

Smelting installations, copper minerals, slags, crucibles and tuyeres are absent among the finds of the Usatovo and Cernavoda III periods, but there are some feeble indications for ore beneficiation. At Kochkovatoe 30/2, two egg-shaped stones with greenish traces of oxidized metal, which may have been used for crushing ores or slags, were found in a grave containing the skeletons of a juvenile and an infant (Vanchugov et al. 1992, 25 f., Fig. 7, 4.5).

In summary, during the fifth millennium BC, high-grade copper ores were mined at the sources and brought to the settlements to be smelted in small quantities in crucibles. To date, comparable evidence for smelting from the fourth millennium is not available. We remain largely ignorant about whether these simple smelting practices continued into the fourth millennium BC or changed.

Alloying, Melting and Casting

Around 4000 BC the metalworkers of the western Black Sea littoral began to produce copper with a high arsenic content. Unalloyed copper remained the major raw material for many centuries after the introduction of the alloy.[81] In the second half of the fourth millennium, however, arsenical copper became prevalent.[82] While several awls from Usatovo I-12, I-13, Kurgan 3/2, flat graves 12 and 13 at Majaki, and Purkary 1/30 have been manufactured from "pure copper", all large tools and weapons contained up to several percent of arsenic (e.g. all daggers, axes and chisels from Purkary 1/21, Tudorovo, and Usatovo) (see Kamenskij 1990; Konkova 1979; Meljukova 1962, 83, Table 1). The dagger from Grave 984 at Durankulak, dating to the Cernavoda III period, was also manufactured from arsenical copper (Todorova 2002, 160).

Two objects of arsenical copper with a high content of nickel have been identified among the finds at Usatovo: a flat axe and a dagger.[83] Both artefacts originate from the same grave in Kurgan II-9 (Patokova 1979, 58–61, Fig. 23). Moreover, a dagger containing 0,1 per cent nickel has been reported from Purkary 1/21 (Kamenskij 1990, Table 1). This "high nickel alloy" was an exotic rarity for the western Black Sea coast. Copper with similar content was characteristic of the metallurgy of the north Caucasus (see Chapter 4), and the finds from Usatovo and Purkary might possibly represent imports from this region. The form of the flat axe from Usatovo II-9 supports this assumption, since it has no parallels among the late Tripolie artefacts (see Konkova 1979, 170).[84]

The most significant technological changes induced by the introduction of arsenical copper were probably related to the superior casting properties of the new alloy. The advantages of casting arsenical copper seem to have stimulated experimentation with different techniques and forms, for example the manufacturing of long daggers with midribs.[85]

Two casting techniques have been attested in the metalwork of the Usatovo group. Simple open moulds were employed to produce pre-forms for small flat axes and awls, and possibly also for simple small daggers (Konkova 1979, 170). Larger objects were cast in more sophisticated, closed two-part moulds. Finds of bivalve moulds have not been reported, though their use is documented by casting seams and supported by the fact that the axes were cast in an upright position (Konkova 1979, 169, 174; Ryndina and Konkova 1982).[86] The unusual shaft-hole axe from Grave 35 at Alexandrovka (Videiko and Burdo 2004a, 390), if it was indeed a local product, attests to the practice of casting with a core.[87] A spoon-shaped crucible from Usatovo with traces of slag and a diameter of 5 cm (Patokova 1979, 42, Fig. 54, 1) might have been used for melting and pouring small quantities of metal.

Metalwork

Hot- and cold-hammering became standard technical operations in the copper working tradition of Tripolie during its B2 and C1 phases. Most large copper tools were cast and subsequently forged into shape at 600–900°C (Ryndina 1998, 132, 149).[88] This appears unusual, since hot-hammering is not a feature of advanced copperworking, and even objects cast of unalloyed copper are generally ductile enough to be shaped cold. However, as Kienlin has demonstrated, if the casting technique is poor, oxygen intake and the formation of eutectic oxides [(Cu + Cu_2O)-eutetic] during cooling can lower the deformability of copper and discourage cold-working. On the positive side, the eutectic oxides contribute significantly to the hardness of the cast object, and thus compensate for the hardening function of cold-hammering (Kienlin and Pernicka 2009, 266). Kienlin suggested that the axe-adzes of the early fourth millennium in the Carpathian basin were shaped at high temperatures simply because they were adequately hard even without arduous cold-hammering. This might have been the case in the metalwork of middle Tripolie, too.

The conditions for casting and hammering larger copper tools changed, however, with the widespread use of copper-arsenic alloys during the late Tripolie period. Unlike the (Cu + Cu_2O)-eutetic, inclusions of mixed copper-arsenic oxides can significantly increase cold-workability but reduce the hardness of the cast pre-form (Kienlin and Pernicka 2009, 265, 269, with further references). Thus, with the introduction of arsenical copper, cold-working became essential for improving the mechanical properties of the finished tools. Since handling hot metal and especially heating copper with high arsenic contents are connected with risks of accidents and poisoning (see Chapter 4; cf. Lechtman 1996, 502), one would expect that cold-hammering quickly replaced earlier practices. This was, however, not the case. Hot-working seems to have persisted even after the wide adoption of arsenical alloys. Metallographic analyses of series of arsenical copper objects from Purkary and Usatovo demonstrated that shaping was still carried out at very high temperatures, although in a range of 400–600°C that was lower than the one previously used for unalloyed copper (Kamenskij 1990; Ryndina and Konkova 1982; Konkova 1979, 169).[89] Only the working edges of some tools were work-hardened cold, a technique that emerged during the Tripolie B2 period (Ryndina 1998, 149).[90]

The techniques of manufacturing metal sheet and wire by hammering were developed during the early phases of Tripolie (Ryndina 1998, Table 56). There is no evidence that the superior ductility of copper-arsenic alloys stimulated the metalsmiths of the late Tripolie period to experiment with copper sheets: the processing of sheet metal and wire and the finishing of cast tools in this period utilized only very simple basic methods of cutting, bending, rolling and drilling.[91] Cutting, bending and rolling were used to manufacture small spirals, tubes and appliqués, while daggers were drilled for attachment to a handle by means of rivets (Ryndina and Konkova 1982, 33).

The large daggers found at Usatovo were covered with a silvery layer which was developed by inverse segregation, the enrichment of the surface with arsenic during the cooling of the cast pre-form (Ryndina and Konkova 1982, 34 f.) (Fig. 6.20). While this process may have been uncontrolled, the appealing silvery colour was apparently highly appreciated. Some finds even suggest that a controlled method for its creation was sought. According to Ryndina and Konkova (1982, 39), a special technique of surface treatment was used to achieve the silvery surface of the long dagger from Utkonosovka: in order to reliably create a surface layer rich in arsenic, the blade of this artefact was covered with a mixture of charcoal, arsenic oxide and plant ashes and heated to 350–450°C.[92]

Several graves of the Usatovo group contained silver spirals (Fig. 6.19, 10–14).[93] We do not have any clues about the origin of these objects; their chemical composition suggests native or smelted (but not cupelled) silver.[94] The spirals from Usatovo were certainly not the earliest silver artefacts in this region. Several small artefacts made of silver and a copper-silver alloy have been reported from sites of the Tripolie B2-C1 period, dating to the first half of the fourth millennium BC. For example, a ring containing 80 per cent silver and 20 per cent copper has been found during excavations at the Tripolie B2 site of Nezvisko on the middle Dnestr (Ryndina 1962, 86). Moreover,

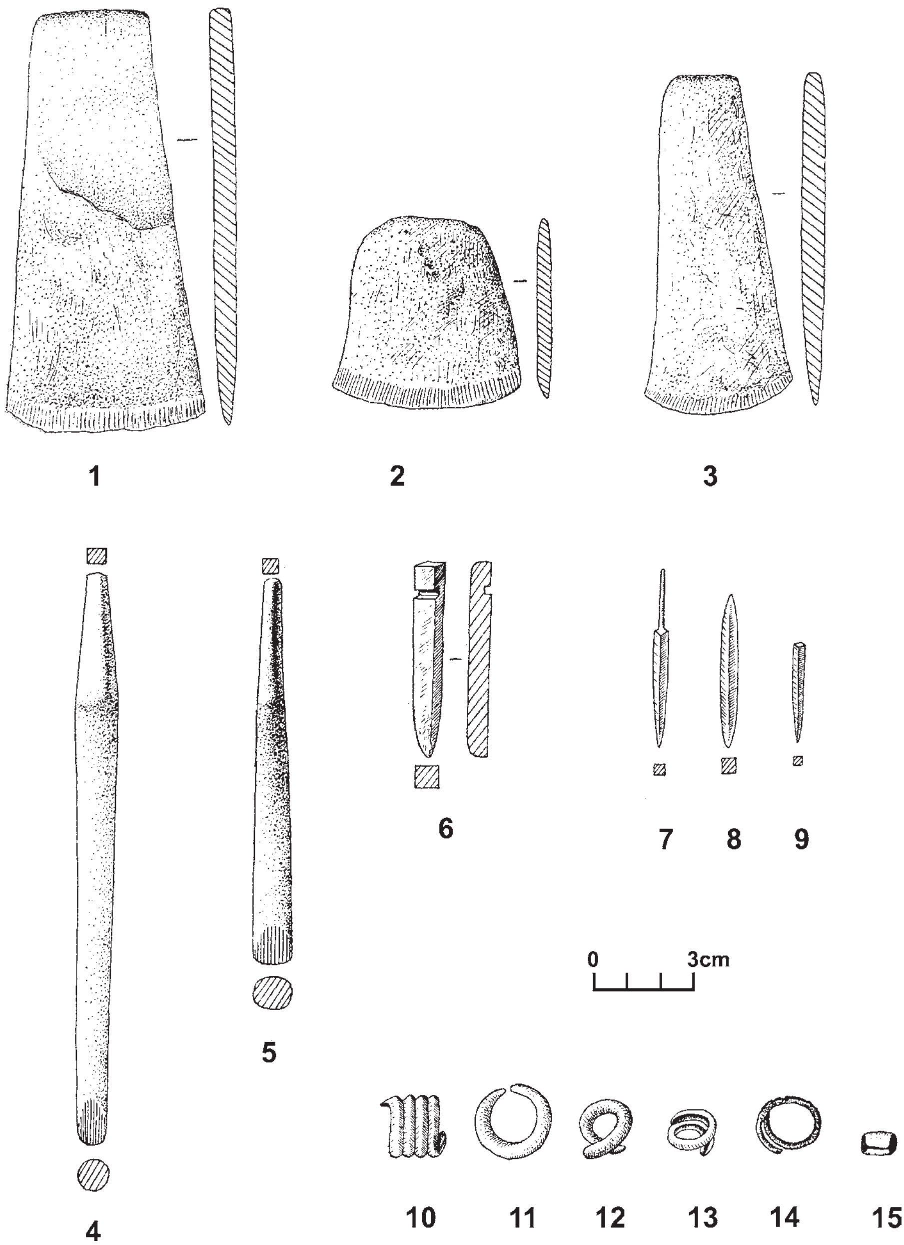

Figure 6.19 Metal artefacts of the Usatovo group from graves at Usatovo I-13 (1.4.10–12), Usatovo II-3 (2), Usatovo I-12 (3.5.8), Tudorovo (6), Usatovo I-3 (7), Usatovo I-7 (9), Sukleja, Kurgan 3 (13) (after Zbenovich 1974, Fig. 26), Usatovo I-11 (14) (after Patokova 1979, Fig. 24, 2), and Usatovo I-15 (15) (after Zbenovich 1974, Fig. 26, 14). 1–9.15 copper; 10–14 silver.

Grave 14 in Kurgan 10 at Trapovka, situated in the region of the lakes north of the Danube delta, contained a silver ring (Rassamakin 2004b, 133 f., Pl. 422, 3). This grave belongs to the so-called Utkonosovka type, which can be synchronized with the Tripolie C1 period.[95]

Metal Inventory

Flat axes, chisels and daggers are the only large cast implements manufactured in the coastal zone during the Usatovo period (Fig. 6.19).[96] Flat axes belong to the local metalworking tradition of south-east Europe (Zbenovich 1974, 75). Six flat axes were found in the kurgan cemetery at Usatovo (Kurgan I-3, 9, 12, 13, 14 und II-3) and three further examples in the large kurgans at Alexandrovka and Purkary (Patokova 1979; Videiko and Burdo 2004b; 390, Jarovoj 1990, Fig. 28) (Pl. 65, 2). Chisels, the only tool in the Usatovo inventory which has no equivalent in other late Tripolie groups, occur only infrequently.[97] Finds have been reported from Usatovo I-12, I-13, Purkary 1/21 and Grave 35 at Alexandrovka (Zbenovich 1974, Fig. 26; Videiko and Burdo 2004b, 390; Jarovoj 1990, Fig. 28). Shaft-hole copper tools, with the exception of the axe from Grave 35 at Alexandrovka (Videiko and Burdo 2004b, 390), were unfamiliar to the Usatovo craftspeople.[98]

Local metalsmiths manufactured two types of daggers (Zbenovich 1974, Fig. 28). Daggers with short blades and long hafts of bone or wood have been found in graves at Usatovo, in Grave 35 at Alexandrovka, at Nerushaj 9/82, Majaki 1/5, I/3, IV/13, in Kurgan 1/16 at Ogorodnoe 1, in Grave 982 at Durankulak and in

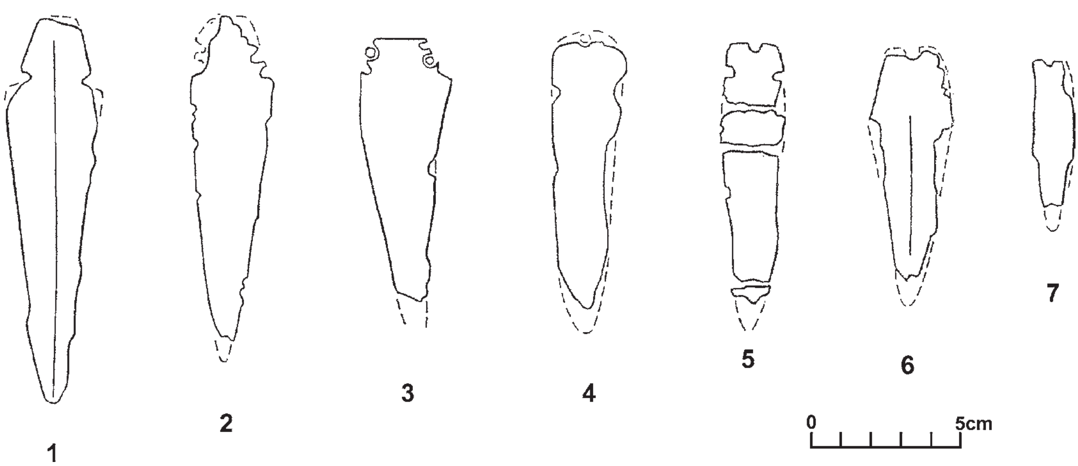

Figure 6.20 Copper daggers from the cemetery of Usatovo I (1–5) and from the settlement site at Usatovo (6–7). After Zinkovskij and Petrenko (1987, Fig. 8).

the Cernavoda III settlement at Dragantsi (Zinkovskij and Petrenko 1987, Fig. 8; Videiko and Burdo 2004b, 390; Dergachev and Manzura 1991, Fig. 38 and 39; Patokova et al. 1989, Fig. 21, 5, Fig. 23, 6, Fig. 24, 14; Gergova et al. 2010, Fig. 3) (Figs. 6.6, 6.13 and 6.21). The second type, long daggers with blades measuring between 17 and 22 cm and a strong midrib, originate from Kurgan 3 at Sukleja and Kurgans I-1 und I-3 at Usatovo (Dergachev and Manzura 1991, Fig. 47; Patokova 1979, Fig. 16, 2; Fig. 19, 3) (Fig. 6.8). Both dagger types are representatives of a "southern" tradition, distinguished by a three-sided base and hafting by means of rivets, and have predecessors in west Anatolia, southeast Europe and the Carpathian basin. The earliest daggers in the region east of the Carpathians date around 4000 BC and belong to the widely spread type with rounded bases (type Bodrogkeresztúr; see Vajsov 1993),[99] while riveted daggers appeared in the second quarter of the fourth millennium BC in a large area stretching from west Anatolia to the Carpathian basin.[100]

The only form of small cast tools are copper awls with rectangular sections (Zbenovich 1974, 72) (Fig. 6.19, 7–9). Cast ornaments

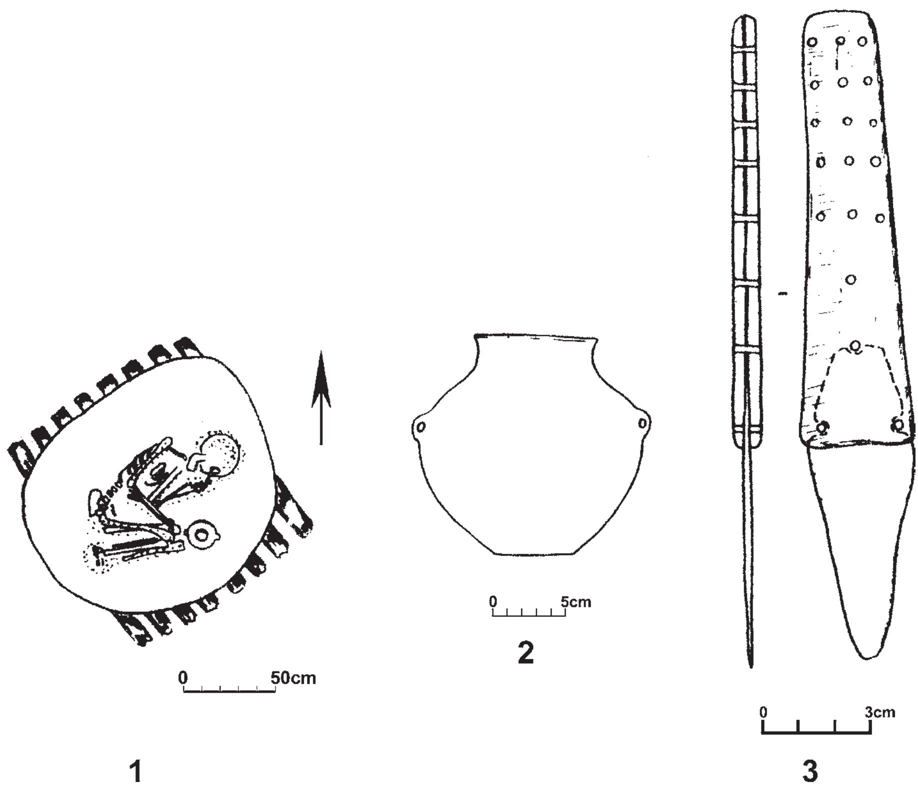

Figure 6.21 Grave 1/16 at Ogorodnoe I with a ceramic vessel and a copper dagger with a bone hilt. Reproduced with permission by I. Manzura from Dergachev and Manzura (1991, Fig. 38).

like beads, pins and figurines are absent. Metal decorations were generally rare and were limited to very simple items manufactured from sheet and wire (Fig. 6.19, 10–15). Rolled tubes of copper sheet have been found at Zalts 4/4, Usatovo I-15 Pit 2, Taraklia 2 10/2, Roshkani 5/7, and Purkary 2/13 (Ivanova et al. 2005, Fig. 9, 4; Patokova 1979, 75, 109; Dergachev and Manzura 1991, Fig. 35, 6, Fig. 44, 3; Jarovoj 1990, 98, Fig. 43, 3). Moreover, a wooden vessel with applications of copper sheets has been reported from Grave 4 in Kurgan II-6 at Usatovo (Patokova et al. 1989, 97, Fig. 34, 31–32). Copper and silver wire was shaped into small rings and spirals (Fig. 6.19).[101]

SOCIAL PRACTICES AND THE EMERGENCE OF MONUMENTALITY

In their symbolism and imagery, the coastal communities of the Usatovo and Cernavoda III groups were closely related to the farming cultures in southeastern Europe. The complex painted pottery tradition and the custom of creating three-dimensional clay representations were alien to the grasslands north and east of the Black Sea.

The uniform painted pottery designs of Usatovo suggest that the potters of the coastal zone shared a system of rules, patterns, and the ability to construct "appropriate" decorations from a pool of design elements. This design tradition was also possibly employed on organic artefacts like baskets, mats and textiles, and certainly had connotations of cultural affiliation, social knowledge and competence.[102] Like painted pottery, the practice of manufacturing and using three-dimensional clay representations originates from the farming cultures of southeast Europe (see e.g. Todorova 1986 and Todorova and Vajsov 1993 for the sixth and fifth millennia BC in the east Balkans). In line with the general trend towards a decline in the use of clay figurines and models during the late Tripolie period, communities in the coastal region manufactured only a very narrow repertoire of clay objects with domestic and agricultural connotations. The most frequent type of abstract human figurine has a cube-shaped lower part and an upper part reminiscent of a phallus (Zbenovich 1974, 104, Fig. 38, 1–4). Inside some figurines was concealed a core of red ochre (Patokova et al. 1989, 103). The clay figures were part of the mortuary practices and were predominantly associated with graves of infants and children.[103] Clay figurines of animals have been reported from the settlement at Usatovo (Patokova 1979, 40).

Practices of modification and adornment of the human body can be deduced from the treatment of the dead. The study of skeletal remains from Majaki and Usatovo detected bands, stripes and stains of colour on the bones (Zinkovskij and Petrenko 1987) (Fig. 6.22). The bodies of the deceased were apparently painted with yellow, red, brown, black and white pigments before burial. Ochre-painted motives were observed on the facial parts of the female skulls and on all parts of the male skulls. The head of the male was apparently shaved and painted, or the hair was woven into a special hair dress with ochre-coated braids. Ochre was used not only for body painting but also on animal bones associated with the grave, and for shaping the core of human clay figurines (see Patokova et al. 1989, 103). While the exact meaning of this pigment remains elusive, ethnographic observations suggest that red ochre might have been used as a substitute for blood in the burial rituals (Timm 1964). It seems plausible that the ritual use of pigments was not reserved for the bodies of the dead, but was also practiced by the living. Furthermore, the inhabitants of the coastal zone appreciated shining and contrastive ornaments like copper and silver rings and appliqués; pendants of animal teeth; and items made of small black and white cylindrical beads of stone, shell, faience, bone, and clay (see Zbenovich 1974, 65) (Fig. 6.23).

Violence, and close combat in particular, attained new significance with the wider spread of copper daggers in the second half of the fourth millennium BC. The dagger is a weapon for stabbing and cutting in very close quarters. In contrast to earlier types of weapons, daggers have no immediate utilitarian function, except personal defense and violence against humans. The dagger thus may

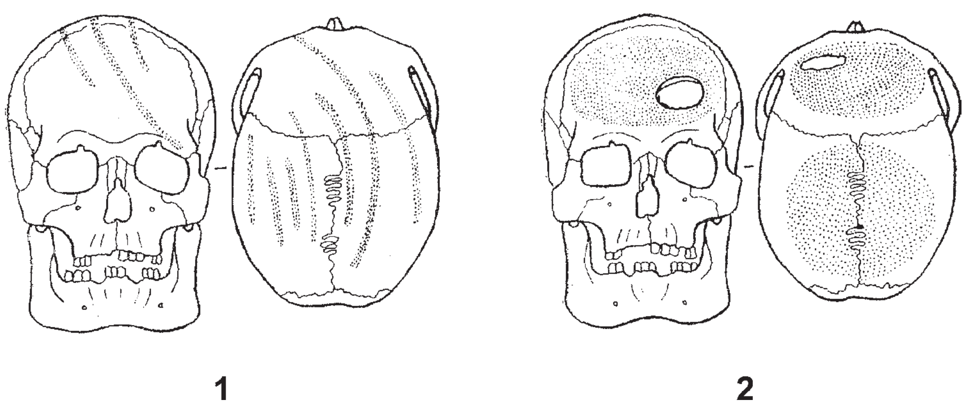

Figure 6.22 Male skulls with traces of red paint from Usatovo. After Zinkovskij and Petrenko (1987, Fig. 1).

be associated with bravery and physical aggression, and the copper daggers with appealing silvery surfaces and decorated hilts might have been important signs of status. Yet, it would be erroneous to regard the dagger as an exclusively masculine symbol, since daggers have also been found in female graves, for example at Nerushaj (Patokova et al. 1989, 97). Actual evidence of violence, for example numerous skull injuries inflicted with heavy hammer-axes, is available from the cemeteries at Usatovo and Majaki (Fig. 6.22, 2).[104]

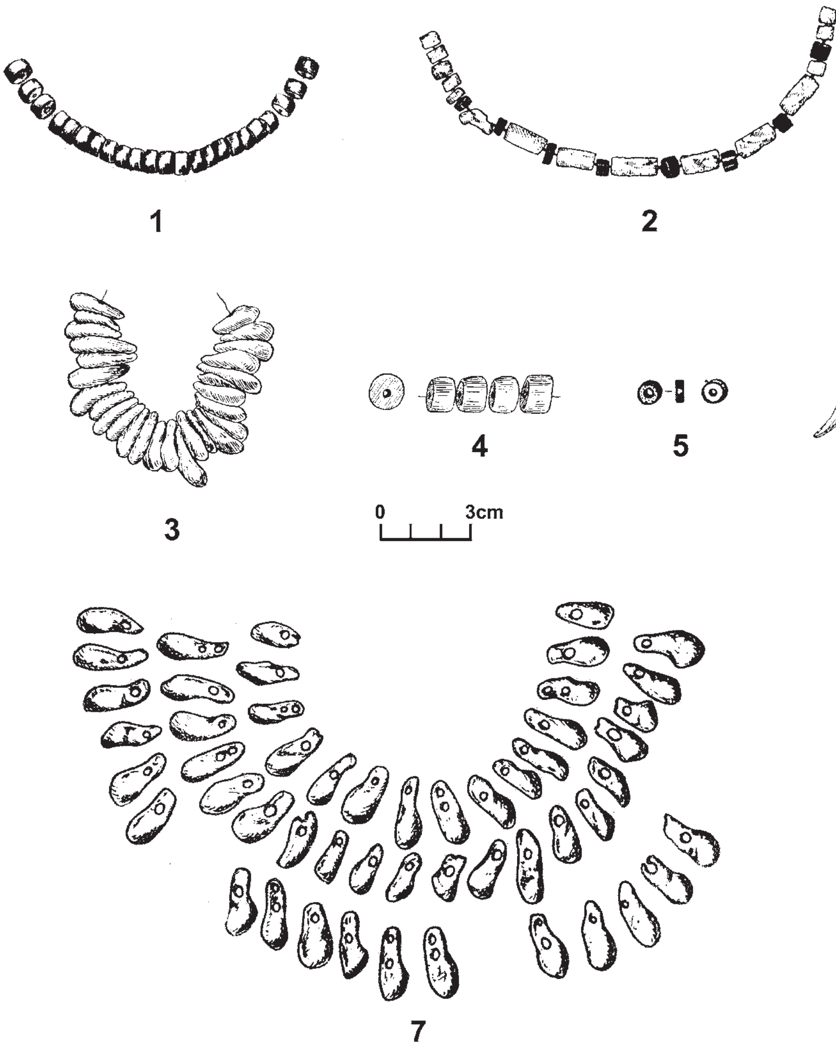

Figure 6.23 Beads and pendants of bone and animal teeth from the settlement at Majaki (6) (after Zbenovich 1974, Fig. 25, 18) and from graves at Sukleja, Kurgan 3 (1) (reproduced with permission by I. Manzura from Dergachev and Manzura 1991, Fig. 47, 12), Usatovo II-1 (2) (after Zbenovich 1974, Fig. 25, 16), Usatovo I-11 (3) (after Zbenovich 1974, Fig. 25, 15), Usatovo I-7 (4) (after Zbenovich 1974, Fig. 25, 14), Bolgrad, Kurgan 6 (5) (after Subbotin and Shmaglij 1970, Fig. 10, 1), and Tudorovo I 1/1 (7) (reproduced with permission by I. Manzura from Dergachev and Manzura 1991, Fig. 52, 5). 1.2.4.5 stone; 3.7 stag teeth; 6 animal tooth.

The habit of constructing burial mounds appeared in the grasslands of the northwest Black Sea in the early fourth millennium BC (Manzura 1990). Funeral feasting and construction of imposing burial monuments, however, achieved unprecedented prominence during the Usatovo period. Traces of animal sacrifice, food consumption and other ritual activities related to the funeral ("sacrificial pits", etc.) have been often observed during excavations of kurgans of the Usatovo group. The funeral feasts might have been associated with processions, performances, dramatic sacrifices, and ritual costumes, but such practices leave only obscure traces in the archaeological record.[105]

Some funeral feasts were especially lavish. In Kurgan 1 at Purkary, for example, several large and valuable animals were slaughtered and consumed at one occasion and their bones were deposited in a pit near the grave (Jarovoj 1990, 215). Moreover, some funerals concluded with the construction of a large and complex burial monument. Stone belts and circles, standing stone slabs with cup marks and monumental "stelae" with engraved depictions of humans and animals have been reported from the site at Usatovo. Kurgan I-11 at Usatovo and Kurgan 1 at Purkary are among the most extravagant monuments of the late fourth millennium BC. The latter structure was about 3 m high and surrounded by a huge circle of stone rubble with a diameter of 40 m (Jarovoj 1990, 62 ff.). The undamaged grave under this imposing monument contained both sacrificed animals and numerous outstanding vessels, tools and items of decoration. It was associated with the previously mentioned pit and four very large hearths.

Funeral feasts and ceremonies are important arenas of social interaction and the display of "prestige" burial gifts and valuables is intended to impress the attending guests as much as to honour the deceased (Hayden 2009, 40 f.; see also Chapter 4). The practice of "fancy" elaborate funerals by the village societies in the northwest Black Sea littoral hints that wealth accumulation was part of social competition. Notably, the cemeteries of the large central community at Usatovo contained significantly more graves with outstanding finds and monumental features than those of smaller and less prominent groups. The graves at Majaki, for example, were grouped in two clusters of small kurgans, among which only one can be regarded as exceptional.[106]

USATOVO, THE FOREST-STEPPE AND THE DANUBE

The technological system of the inhabitants of the northwest Black Sea coast during the Usatovo period had barely any local antecedents in the coastal grasslands between the southern Bug and the Danube. In fact, the history of occupation of this region prior to the Usatovo period was a short one (for a lucid summary see Manzura 2005a). By the middle of the fifth millennium BC, farming societies have expanded to the immediate border of the arid steppe. However, the archaeological record does not provide any evidence that the coastal zone was inhabited. During the second half of the fifth millennium, when a large and lively exchange network for valuables and exotica spanned the Balkan-Carpathian area and exchange with the grasslands intensified, a few scattered graves of the so-called Suvorovo group, with comparisons in the southern Ukraine, appeared in the steppe between Dnestr and the Danube delta. Apparently, single steppe communities were attracted by the possibility of acquiring desired exotic objects and occasionally penetrated this region from the east; nevertheless, the area remained very sparsely populated. In the first half of the fourth millennium, the situation changed dramatically and the previous marginal zone was dotted with numerous burial mounds. Manzura (2005a, 323) speaks of a "stage of domestication" and emphasizes that the pottery material from these mounds resembles the Cernavoda I assemblage on the lower Danube. This was the time when monumental grave constructions appeared in the costal grasslands. However, habitation sites of this period have not been yet identified, while graves contained very few objects and evidence of complex manufacturing technologies is absent (for a selection of finds see Manzura et al. 1995, Fig. 4).

This brief overview underscores the uniqueness of the technological system that emerged in the northwest grasslands during the Usatovo period. It seems very likely that the innovations of the later fourth millennium BC were introduced by "colonist" farmers from the agricultural zone in the forest-steppe.[107] Both in shapes and decoration, painted ware of the Usatovo group were nearly identical to the pottery of the late Tripolie groups in the forest-steppe area (see Dergachev 1980, Fig. 37). Most shapes of the "kitchen" pottery also correspond to those in the middle Dnestr region (Vykhvatintsy group), with the exception of beakers with cylindrical necks.[108] Although decorations on the kitchen pottery are more common in the Usatovo group than in its mid-Dnestr counterparts, both regions share the basic techniques and motives. The metallurgy of the Usatovo group has no predecessors in the coastal grasslands, while its Tripolie roots are clearly recognizable. Finally, the site at Usatovo, encompassing a major settlement with long permanent habitation and a large cemetery with significant amounts of complex metal artefacts and imported materials (copper, flint, exotica), is exceptional for the steppe zone of the Black Sea.

External long-distance contacts played limited roles for the village societies on the coast. As has already been pointed out, communities in the coastal area of the northwest Black Sea participated in a network for supply with copper ingots (or copper minerals) and long regular flint blades. However, these foreign commodities originated from the territory of groups whose material culture was closely related to Usatovo. Real "exotica", that is objects and materials from distant regions and foreign cultures, remain very rare among the finds: a piece of stibnite originates from the settlement of Usatovo, while a small bead of amber was found under the stone pile of Grave 4 of Kurgan I-4 at the same site, and "coral" beads were reported for Usatovo, Sukleja and Alexandrovka (Patokova 1979, 49 f., Fig. 20, 8; Videiko and Burdo 2004b, 216; Dergachev and Manzura 1991, 71, Fig. 47, 12).[109] Ornamental stones like black agate, anthracite, lignite and mineral pigments appear as further possible exotic commodities, though there has been no systematic research on their provenance.

Relationships of the Usatovo communities with their eastern neighbours seem to have been rather infrequent. Bone beads from the Dnepr region have been found in a grave at Sadovoe and one vessel from the steppe region north of the Black Sea was placed in Grave 2 of the flat cemetery at Usatovo (Maljukevich and Petrenko 1993, Fig. 5; Patokova 1979, 117 f., Fig. 43, 6). Moreover, the copper objects with high nickel contents and the silver and faience ornaments may have been imported from the north Caucasus or replicated Caucasian prototypes (see the section titled "Alloying, Melting and Casting" in this chapter). Yet, the complete absence of pottery or valuables of Caucasian origin suggests that exchange between the two regions was either insignificant or incidental. The relations of the Usatovo communities with their immediate neighbours on the lower Danube were very weak as well.[110] For example, the pottery of these two regions displays almost no common features or imports (Manzura 2001). Only a few sherds with pattern polishing and vessels with vertical relief “rolls” and horizontal tunnel lugs under the rim from Usatovo and Majaki are reminiscent of the pottery of Cernavoda III (see Patokova et al. 1989, 115; Petrenko 1991, 75).

In summary, the external contacts of the societies in the northwest Black Sea were directed mainly to the north and northwest, that is to related late Tripolie communities. Contacts with the steppe regions on the lower Dnepr and the Azov coast were, at best, sporadic while the north Caucasus exerted hardly any influence on the technology or inventory of Usatovo. Especially striking is the absence of shaft-hole axes and tanged daggers in the latter group. On the contrary, the metal inventory of the Usatovo group was closely related to the traditions of southeast Europe and western Anatolia.[111] It seems that the northwest coast was not a link between the east Black Sea (and by extension southwest Asia) and the Carpathian basin, but rather a poorly connected region on the far-off periphery of a large cultural area spanning central and western Anatolia and the Balkans.

A final question concerns the extent of contacts between southeast Europe and Anatolia during the fourth millennium BC. While the similarities in the material culture of the Balkans (Cernavoda III) and the Carpathian basin (Baden-Boleráz) are striking, their correlation with western Anatolia remains very elusive. The characteristic dark burnished channelled pottery, for example, reaches southwards to the Aegean coast (e.g. the sites of Sitagroi IV and Dikili Tash IIIA; see Maran 1998, with discussion and references). Further southeast, in Anatolia, societies of the later fourth millennium BC and their material culture remain largely unexplored.[112] In conclusion, it seems unlikely that the relationships between southeast Europe and Anatolia in the mid- and late fourth millennium will not be resolved until new data from west Anatolia become available.

7

Unknown Coasts: The Black Sea Littoral of Anatolia

INTRODUCTION

Archaeological Fieldwork

The only regular archaeological excavation in the western part of the Anatolian coast was carried out by Akurgal and Budde in 1951 and 1954 at the site of Kocagöz Höyük, near the village of Demirci on the Sinop peninsula. The results of their fieldwork have been published in short preliminary reports (Akurgal 1956; Akurgal and Budde 1956; Erzen 1956).[1] The excavators observed a stratum with three phases of occupation containing red slipped wares and shapes comparable to Troy I–II. Below this stratum, dating to the first half of the third millennium BC, lay an earlier layer with pre–Bronze Age material which has not been subject to excavation. Burney (1956, 184), who studied the ceramic finds from Kocagöz at the University of Ankara, noted a sherd from this earliest level that had a grey burnished surface and a decoration with incised lines and rows of dots. According to him, this pottery differs from the black burnished "Chalcolithic" wares at Maltepe (for the site of Maltepe see Burney 1956 and note 5 in this chapter), though he did not comment on its possible dating.[2]

Some evidence for the fourth-millennium occupation of the western part of the coast has been made available by archaeological surveys. During fieldwalking in the region of Devrek-Gökçebey and Zonguldak, Karauğuz identified Chalcolithic and Early Bronze Age pottery at the sites of Boncuklar Höyük and Buldan Höyük, situated some 30 km from the coast (Karauğuz 2005, 70; 2006, 329 f., Fig. 1–6). Unfortunately, these sites were barely mentioned in the preliminary report. Further to the east, the peninsula of Sinop has been repeatedly subjected to extensive surveys.[3] Among the researchers working in this area since the 1950s, the team of Doonan was the only to attempt a systematic survey of nearly full coverage comparable to the Mediterranean regional projects (Doonan et al. 2001; Doonan 2004).[4] In 1997–1999, the Sinop Regional Archaeological Project (SRAP) carried out intensive and extensive fieldwalking in the Karasu and Demirci valleys. The abundant plant cover necessitated a compromise between intensive fieldwalking and more extensive methods of surveying in areas of low visibility, as well as sampling of whole landscapes by transects. The research of SRAP continued during the 2000s, though the results of this fieldwork have been only inadequately published (see Doonan 2004; Bauer 2006) (Fig. 7.1).

All surveys on the peninsula of Sinop produced similar observations. Small sites on natural elevations and slopes with several metres of deposit are characteristic of the earlier prehistoric period. Numerous sites of the Chalcolithic and Early Bronze Age periods have been identified, but their dating is impeded by the lack of a ceramic sequence for the region (the largest dataset was published by Işın in 1998). Moreover, the ceramic material from the surveys has hardly been published. One of the earliest prehistoric sites is

Figure 7.1 The Black Sea coast at Amasra (picture by the author).

Maltepe near Hacıoğlu, dating possibly to the fifth millennium BC.[5] Burney (1956, 183, Fig. 24) compared the very fine black burnished ware found at Maltepe with characteristic pottery from the region of Samsun, while Bauer (2007, 232) observed similarities between the oyster gray burnished ware from Maltepe and the so-called Büyükkaya ware found at İkiztepe and Büyük Güllücek.[6] Moreover, the site of Güllüavlu produced one sherd with comparisons in Assemblage AA at İkiztepe (Doonan et al. 2001, 116, Fig. 11).[7]

The area of the deltaic plains of Kızılırmak and Yeşilırmak is the only coastal region which has been relatively well studied (Fig. 7.2). Several excavations have been carried out since the 1940s. In 1940–1941, Kökten, Özgüç and Özgüç investigated the sites of Dündartepe and Tekeköy near Samsun, and Kaledoruğu near Kavak (Kökten et al. 1945). Dündartepe is situated on a slope on the bank of the Mert River in the southeast fringes of the city of Samsun. Three of the trenches, one on the summit (Area B) and two in the railway cut (Areas A and G), produced deep stratified deposits with ceramic assemblages predating the third millennium BC.[8] A sounding at Tekeköy, a small mound situated on the periphery of the deltaic plain of Yeşilırmak some 14 km east of Samsun, yielded comparable materials. However, the finds from these excavations are barely

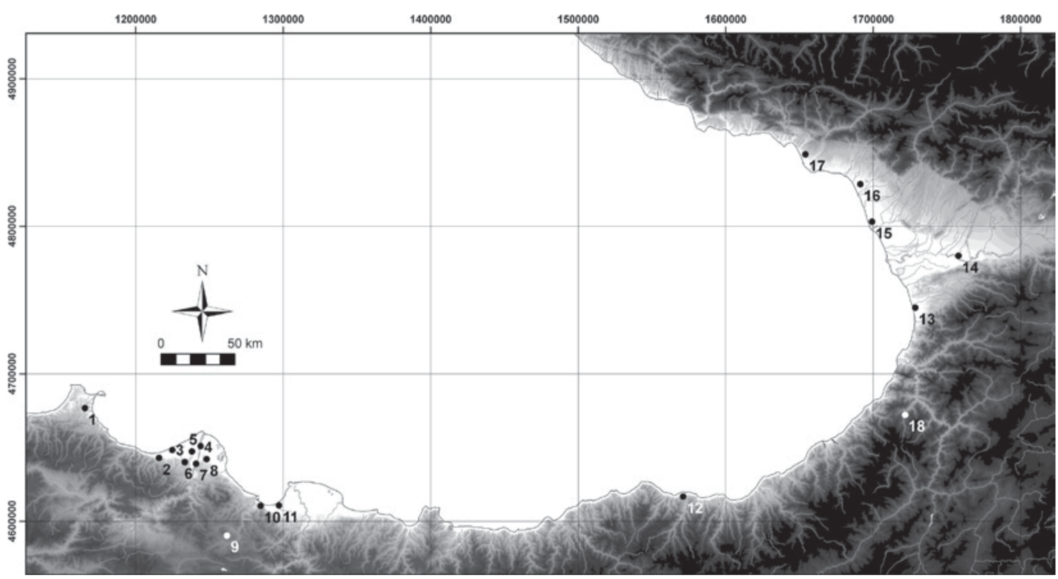

Figure 7.2 Principal sites on the Black Sea coast of Anatolia and the Caucasus mentioned in Chapter 7: (1) Kocagöz, (2) Sivritepe, (3) Gökçeboğaz, (4) İkiztepe, (5) Şirlek, (6) Tedigün, (7) Tepe Tarla, (8) Kelebeş, (9) Kaledoruğu, (10) Dündartepe, (11) Tekeköy, (12) Trabzon, (13) Ispani, (14) Dabla gomi, (15) Pichori, (16) Ochamchir, (17) Machara, (18) Murgul.

mentioned in the preliminary report of Kökten et al. (1945). The early layers at Tekeköy were apparently disturbed and the material from different periods mixed (cf. Schoop 2005, 307). A similar stratigraphic situation was observed during the excavations at a third site, the settlement Kaledoruğu near Kavak about 40 km upstream from Dündartepe (Kökten et al. 1945).

Excavations at the site of İkiztepe in the delta of Kızılırmak began in 1974 and continue to the present.[9] İkiztepe is the largest documented prehistoric site on the southern coast of the Black Sea. It encompasses four settlement mounds, of which only Mounds I, II and III were inhabited prior to the third millennium BC (Fig. 7.3). The long history of fieldwork at İkiztepe includes several major periods of excavations. During the first phase in 1974–1980, prehistoric remains were investigated mainly in two areas – on Mound II (Trench B) and on the saddle between Mound II and Mound I (Trench F).[10] In 1981–1993, the excavations focused on Mound I (Trench D), while in 1993–1999 the team moved to Mound III (Trench L). Since 2000, large portions of Mound I (Trench M and N) have been removed. Most trenches produced undisturbed stratified deposits with distinct pottery assemblages. However, the occupational history of the site is far from simple, and no straightforward correlation of the separate trenches is possible. Moreover, only the excavations in Trenches B, C and F have been published comprehensively (Alkım et al. 1988, 2003).

Field surveys have been carried out in the deltaic plains and in the hilly interior of the central Black Sea region since the 1940s. Kökten, Özgüç and Özgüç surveyed in 1940–1941 the regions of Bafra, Alaçam, Vezirköprü, Havza, and Ladık (Kökten et al. 1945). In 1955, Burney (1956) collected pottery at several sites in the vicinity of Alaçam and Bafra. An extensive survey in the plains of Bafra and Çarşamba by Alkım and his team preceded the beginning of the excavations at İkiztepe.[11] More recently, Dönmez has conducted field research in the regions of Alaçam, Bafra, Çarşamba, Terme, Ayvacık, Kavak, and Asarcık (Dönmez 2001, 2006). All of the surveys demonstrated the presence of a dense network of small settlement mounds with ceramic material comparable to the assemblages from İkiztepe. However, these investigations remain largely unpublished and the surface collections from the early sites have been barely illustrated in the preliminary reports.[12]

The narrow coastal strip on the northern side of the east Pontic Mountains remains nearly unexplored. Several unpublished pottery

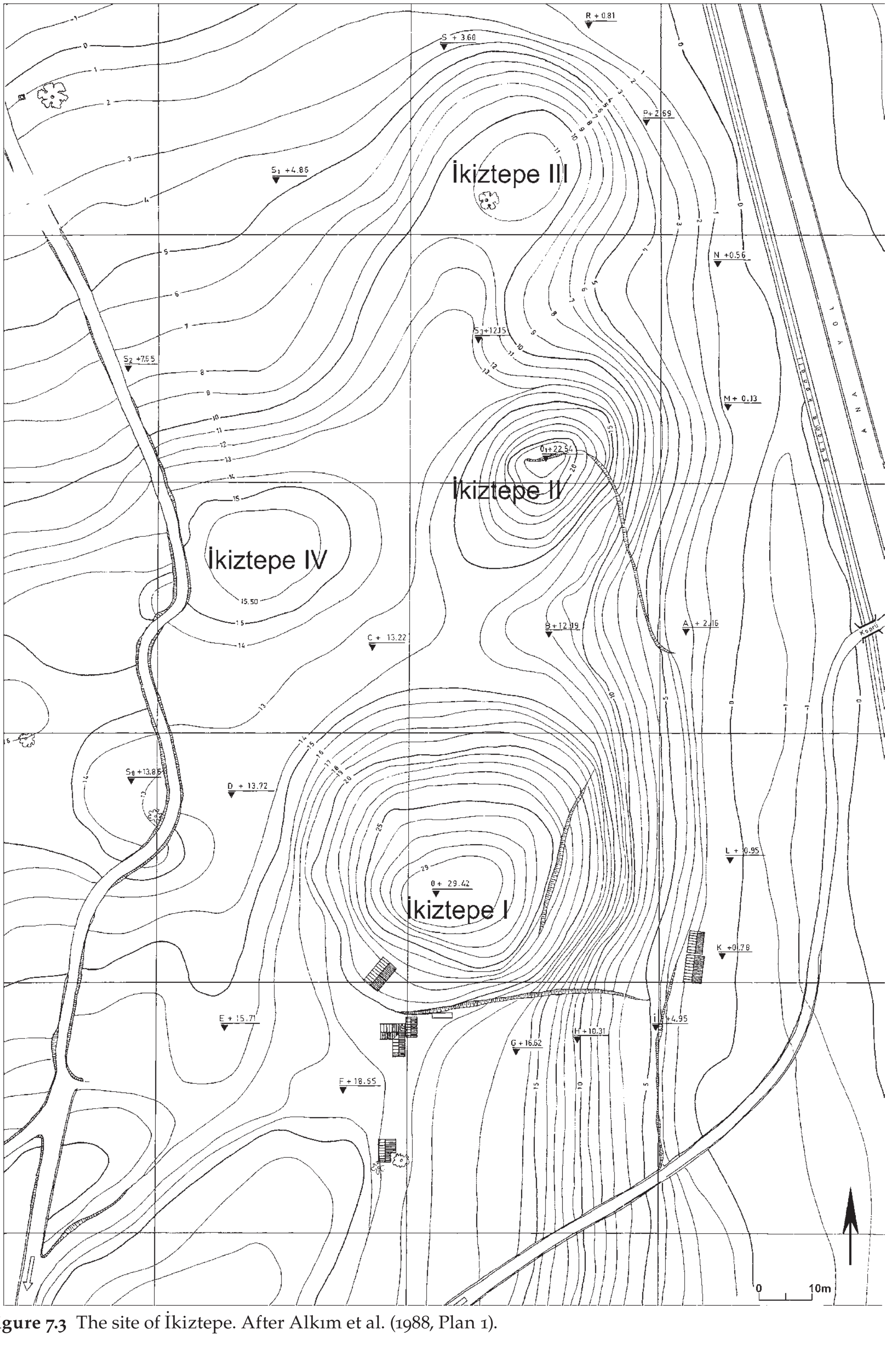

Figure 7.3 The site of İkiztepe. After Alkım et al. (1988, Plan 1).

vessels in the exhibition of the Archaeological Museum in Trabzon and a hoard of gold jewelry from the Burton Y. Berry collection, said to originate from the vicinity of the same city, suggest that the region was inhabited and indeed well connected to other parts of the coast (see Chapter 3). Research from Kolkheti and the coastal strip of the Caucasus hints at the idiosyncrasy of the coastal societies, although the archaeological data about pre–third millennium sites in this region are very difficult to grasp (see Pkhakadze 2000). Bzhania (1967, 1973) has summarized the early stages of research in Abkhazia, which concentrated mainly on cave sites. One of the most important and better-published sites is the Vorontsovskaja cave, situated 22 km from the sea and investigated in 1953–1954 by Solovev (Solovev 1958). The material from Vorontsovskaja represents possibly an early (fifth-millennium BC) habitation phase in the hinterland of Abkhazia and has parallels in sites of the Sioni period in central and eastern Georgia (Solovev 1958, 141).[13] Several prehistoric sites were investigated on the coast of Abkhasia and Kolkheti (Bzhanija 1966; Pkhakadze 1988, 51). Among them, Layer IV at Machara might also date to the Sioni period. According to Bzhanija (1966, 118), the material found in this level demonstrated similarities to Didube, while a ^{14}C dating (LE-1347, 5762±90 BP) points at the first half of the fifth millennium BC (Pkhakadze 1991, 55). Over Layer IV, the excavator observed a stratigraphic hiatus followed by an obvious change in pottery (Bzhanija 1966, 122 f.). The “missing” phase is partly filled by material from Gumista, Ispani (lower layer), and Pichori 8, a group of sites dubbed “Kolkheti Early Bronze Age culture” by Pkhakadze (Pkhakadze 1993, 4). Several ^{14}C dates from these sites point at the turn to the third millennium.[14] A later phase of the Kolkheti EBA, dating to the third millennium and reminiscent of the Bedeni culture in eastern Georgia, is represented at Pichori 7, Ispani (upper level), and Ochamchire (Pkhakadze 1991, 59). Thus, while sites dating to the fifth and third millennia BC are numerous, it seems impossible to find published material from Abkhazia and Kolkheti that can be attributed to the fourth millennium BC. Evidence for the latter period is available only from the upland region of Imereti in the interior of Georgia, where excavations at a series of caves and abris (Samele khlde, Dzudzuana, Darkveti, Tetri-Mgvime, etc.) revealed habitation strata of the pre–Kura-Arax and Kura-Arax periods (Pkhakadze 1988).

THE ALIŞAR PARADIGM

The only site on the northern coast of Anatolia that has produced a long and undisturbed stratigraphic sequence predating the third millennium BC is the settlement mound at İkiztepe near Bafra. Since the excavators of İkiztepe transferred to this coastal site the conception of chronology developed in the 1930s–1960s for central Anatolia, an overview of this (mis)conception is crucial for understanding their views. In 1930–1932, the Oriental Institute of Chicago excavated a deep trench in the mound of Alişar Höyük near Yozgat. The trench reached down to the bedrock and provided a long sequence of nineteen layers. The dating of the layers by the excavator von der Osten was based on two implicit assumptions – that every distinct assemblage has to represent a separate chronological period, and that the sequence at Alişar did not contain any interruptions (the "Alişar paradigm"; see Schoop 2005, 66). Layer 5M could be correlated to the Mesopotamian chronology by finds of Old Assyrian clay tablets. Since this layer dated to the Middle Bronze Age, the assemblage beneath it (6M) had to be dated to the Early Bronze Age. However, two further stratigraphic units were identified below 6M. The material from the upper one (7–11M) showed clear similarities to Troy I–II, but it was not possible to term it "Early Bronze Age" without violating the Alişar paradigm. The lower unit (12–19M) apparently predated Troy and the term "Chalcolithic" seemed appropriate for it. Lying between the Chalcolithic and the Early Bronze Age, the Trojan stratum (7–11 M) was somewhat unfortunately named the Copper Age (von der Osten 1937). Kökten applied this confusing terminology to the coastal sites in the vicinity of Samsun, excavated by him in 1940–1941.

Orthmann (1963) suggested important changes in the chronological scheme of central Anatolia in his dissertation. He rejected the existence of a period predating Troy (Chalcolithic).[15] The earliest phase at Alişar (Layers 19–12M, the "Chalcolithic" of von der Osten), was dated by him to EBI. The only sound argument for this dating was the correlation of the material at Alişar with the black burnished wares of eastern Anatolia (e.g. at Karaz). Alişar 11–7M (the "Copper Age" of von der Osten) was consequently dated to the EBII period. This "short chronology" was transferred, together with the concepts that underlay it, to the materials found at İkiztepe by Alkım in the 1970s. However, an assemblage which seemed earlier than the basal strata of Alişar, and thus had to predate the earliest phase of the Bronze Age (in Orthmann's sense), turned up at the bottom of Trench B of Mound II at İkiztepe and was termed by the excavator "Chalcolithic".[16] It is not surprising that, given this complete terminological and conceptual confusion, the chronology of İkiztepe remained an enigma for most scholars working outside the region.

From the point of view of contemporary radiocarbon chronology, the implicit models of continuity and diffusion underlying the central Anatolian chronological systems of von der Osten and Orthmann are clearly incorrect. Surprisingly, no revision of these views has taken place in the decades after the "radiocarbon revolution". Özdoğan (1991, 218–220; 1996) was the first to question the definition of the EBI period in central Anatolia. He rejected the correlation of the basal layers at Alişar (19–12M) with the Early Bronze Age of the Upper Euphrates (Karaz) and emphasized the clear difference between the black-red pottery from these two regions. Black-red pottery with close resemblance to the central Anatolian wares, Özdoğan observed, has come to light at Tepecik and Arslantepe VIA together with characteristic Late Uruk vessels. Özdoğan used this parallel to the east Anatolian Highlands to anchor the central Anatolian sequence and suggested a synchronism of basal Alişar and the Late Uruk period of Mesopotamia, dating to the second half of the fourth millennium BC. Furthermore, he stressed that the 2 m thick deposit of basal Alişar apparently encompassed more than one phase and might reach considerably further back in time.

An updating of the Alişar sequence inevitably means an earlier beginning for the settlement at İkiztepe. Unfortunately, a simple shift of the sequence of İkiztepe back in time cannot solve the problem with the chronology of this site. Trench B on Mound II was excavated at the beginning of the fieldwork at İkiztepe and provided the longest stratigraphic sequence, consisting of three major stratigraphic units. The middle layer (II) produced pottery with close comparisons at Büyük Güllücek, a site dating to the EBI period according to Orthmann. This layer served as a fixed point in the sequence. The phase below it (I) was dated to the Chalcolithic and the phase above it to EBII (Alkım et al. 1988, 195; see also Schoop 2005, 316). When excavations moved to other areas of the site, new sequences came to light. The excavated assemblages were, however, not dated by comparison to the "key sequence" of Trench B, as one might expect.

The excavators strictly adhered to a normative view with two basic assumptions (cf. Schoop 2005, 315): there is a universal sequence of subsequent stages, and the possibility of interruptions in the stratigraphy can be excluded a priori. The assemblages were dated according to their position in the stratigraphy of the separate trenches and not in relation to each other. Thus, in the course of the long-lasting investigations at this complex site, assemblages that were completely distinct were grouped into the same period, while identical assemblages acquired different dating (Table 3).

First doubts in the dating of the finds at İkiztepe were expressed by Thissen (1993) after his re-analysis of the pottery from Dündartepe. Thissen's attention was drawn to a pottery assemblage excavated by Alkım in 1974 and 1975 in Trenches C and F at İkiztepe, which demonstrated clear affiliation to the material from Dündartepe. The material found in Trench B of İkiztepe, on the other hand, did not have this affiliation to Dündartepe. Since Trenches C and F did not have stratigraphic connections to Trench B, it was not possible to directly assess the chronological order of these two distinct assemblages. Thissen attempted to solve this problem by comparing them with pottery from other regions (the Aegean coast of Anatolia and the Balkans) and concluded that the assemblage in Trench B was earlier than the material from Trenches F and C. He dated the latter to the late fifth millennium BC.[17]

Thissen's approach was developed further by Schoop (2005) in his study of the Chalcolithic period in Anatolia. Schoop considered the pottery assemblages found at İkiztepe by the team of Alkım in 1974–1975 in a wider Anatolian context and rigorously examined their comparisons and possible chronological positions. He introduced neutral terms for these assemblages in order to avoid the confusion of competing chronological systems. The earliest assemblage (AA) at İkiztepe was found in the oldest stratum of Trench B (Alkım 1986). This deposit lay on the bedrock and was covered by a thick layer of sand and clay. Assemblage AA includes pottery with mineral admixtures and black, grey, and brown surfaces. Characteristic vessel shapes are conical bowls, carinated bowls with a straight upper part, and holemouth jars decorated with incised ladder motives filled with pierced dots, relief "waves", and small knobs. Bichrome vessels, white painting, and organic admixtures are absent. Assemblage AA has parallels in Güvercinkayası (e.g. the motive with dots between incised lines; Schoop 2005, 329, Abb. 57, 6), a site dating to c. 5000 BC.

Table 3. Stratigraphy of İkiztepe.

Trench C (1974)		Trench B (1975–1978)		Trench F (1975)		Trench L (1993–1999)		Trench D-M-N (1974–1993, 2000–)	
Schoop	**Alkım/ Bilgi**	**Schoop**	**Alkım/ Bilgi**	**Schoop**	**Alkım/ Bilgi**	**Schoop**	**Alkım/ Bilgi**	**Schoop**	**Alkım/ Bilgi**
EH	EH			EH	EH	EH	EH	EH	EH
–	–			–	–	EBA (graves)	EBIII	EB (graves)	EBII, EBIII
–	–	CC	EBII	–	–	–	–	–	–
DD	EBII	Hiatus	–	EE	EBII	DD/EE	EBIII	DD/EE	EBII
		BB	EBI					BB	EBI
		AA	Ch						
		bedrock							

EH = Early Hittite
EB = Early Bronze Age
Ch = Chalcolithic
AA, BB, CC, DD / EE – pottery assemblages according to U. Schoop (2005)

Moreover, it apparently pre-dates the pottery from Büyük Güllücek, which gives a *terminus ante quem* in the second quarter of the fifth millennium BC (Schoop 2005, 330).

After the hiatus, the stratigraphic sequence in Trench B continues with a deposit containing a different pottery assemblage (BB) (Alkım et al. 1988, Pl. XXV, XXVI, XXXIV). The clay body includes organic admixtures; some vessels have a dark exterior and a light interior surface. Characteristic shapes and decorations are carinated bowls with convex upper parts, horn handles, and incised ornaments on the outside surface and white painted on the inside. Assemblage BB shows very close similarities to Büyük Güllücek, for example bichrome vessels, horn handles, and white painting. Comparisons with other areas in Anatolia suggest, according to Schoop (2005, 329–332), that the assemblage from Büyük Güllücek dates to the second quarter of the fifth millennium. Moreover, the pottery of assemblage BB at İkiztepe has parallels at the east Aegean site Tigani (phases II and III), which belongs to the same time period (Schoop 2005, 329).

The next pottery assemblage DD/EE is absent in the sequence of Trench B. It has been found in Trenches F and C (Alkım et al. 1988, Pl. XLIX) (Fig. 7.6, later).[18] The clay body contains mineral, organic and more rarely shell admixtures. Bichrome pottery becomes frequent, while vessels with thin walls and highly burnished black surface are specific for this assemblage. Assemblage DD/EE contains a wide range of characteristic shapes and ornamentations – sharp carinated bowls with incised decorations, bowls with knobs, upturned lug handles, horizontal and vertical double lugs, and white painting. The correlation of assemblage DD/EE with the sequence in Trench B is not straightforward. Schoop (2005, 320) observes similarities both to BB and to the later assemblage CC (described later) and concludes that DD/EE might take an intermediate position between these two pottery assemblages. A *Terminus ante quem* of 3500 BC for its dating is suggested by the central Anatolian parallels in the pottery of assemblage CC.

The last pre-third-millennium assemblage at İkiztepe (CC) was found in Trench B, where it was superimposed over assemblage BB (Alkım et al. 1988, Pl. XII, 11, XIV, 13, XV, 3, 4) (Fig. 7.7 later). In this pottery material, the division between coarse and fine pottery, the shell admixture and the colour contrast are very pronounced. The shapes change significantly and decorations disappear. Large lugs under the rim and rims bent in a sharp angle are characteristic of assemblage CC. This pottery shows clear similarities to the material from the early levels of Alişar, especially the bichrome vessels, but also the large bowls with bent rims, the large lugs under the rim, etc. (Schoop 2005, 332). The association of central Anatolian-type bichrome pottery with imported Late Uruk wares at some sites on the Upper Euphrates (see Özdoğan 1991, 218–220; 1996) suggests a date around 3500 or later for assemblage CC.

Several sites in the region of Bafra and Samsun can be correlated with the pottery sequence at İkiztepe as described previously. Characteristic shapes of assemblage AA have been reported from Tekeköy (relief "waves" and knobs, horn handles; Kökten et al. 1945, Pl. LXVIII, 5, Pl. LXIX, 6). Assemblage BB was possibly represented in Areas A and G at Dündartepe (Kökten et al. 1945, 367; Schoop 2005, 305). The pottery from these trenches included sand-tempered vessels with black, grey and brown burnished surfaces; white-filled decorations and possibly horn handles (Thissen 1993, note 16; Kökten et al. 1945, Pl. LXIII, 1–6). Sherds characteristic for assemblage BB (white painted interior and incised exterior, horn handles) were among the surface finds from several settlement mounds, such as Şirlek Tepe, Kelebeş Tepe, Bakırdere Tepesi, and Tedigün Tepe in the alluvial plain of Kızılırmak and Ay Tepe near Kavak (Dönmez 2006, 95, Fig. 7, 3.5–6, Fig. 8, 1.3). Assemblage DD/EE was present in Area B at Dündartepe (chaff and shell additions, white painted, carinated bowls, black burnished surface, black-red ware; see Thissen 1993, 213–215), at Tekeköy (black-red pottery, double lugs; Kökten et al. 1945, Pl. LXVIII, 1, Pl. LXIX, 1) and at Kaledoğru (black burnished sherds with white painted decorations; Kökten et al. 1945, Pl. LXVII, 4). Sherds with comparisons in assemblage DD/EE have also been found on the surface of the site at Gökçeboğaz (white painted decorations, black-red ware, horizontal double lugs, knobs) (Burney 1956, Fig. 3.8.15–18).

Series of radiocarbon measurements on plant remains from Mound I and Mound II (Trench B) at İkiztepe have been published by Ergin and Güler (1985, 89), Alkım (1983b, 179) and Özbakan (1985, 97). Unfortunately, the dates disagree with the stratigraphic sequence. For example, samples from the same stratigraphic layer provide dates with a difference of some 2.000 years, and dates from the lower strata are later than those from the upper part of the sequence (for comments see Schoop 2005, 321 f.). The only reliable and up-to-date ^{14}C measurements in northern central Anatolia have been obtained at Çadır Höyük (Gorny et al. 2002, 127, Tables 2 and 3). A stratum with ceramic material comparable to the Chalcolithic assemblage at Alişar M14–12 and thus to assemblage CC at İkiztepe from this site can be dated to the second quarter-middle of the fourth millennium BC.[19]

SOCIETIES IN THE MARGIN

Nucleated villages and small hamlets on low natural elevations are frequent both on the peninsula of Sinop and in the broad plains of the lower Yeşilırmak and Kızılırmak.[20] Long-term occupation was apparently part of the settlement tradition in the deltaic plains, since the few settlements investigated by systematic excavations in this region produced deep stratified deposits (Kökten et al. 1945; Alkım et al. 1988). As has already been mentioned, one of the largest sites of the fifth and fourth millennia BC on the southern Black Sea coast is situated in this part of the littoral at İkiztepe near Bafra (see Alkım et al. 1988, 145) (Fig. 7.4).[21] Yet, even at İkiztepe, only parts of the settlement area were occupied at any given time.

The earliest settlement at İkiztepe (assemblage AA) was situated on a small natural hill (Mound II). A sterile layer of sand and silt

Figure 7.4 The north section of the large trench on Mound I of İkiztepe in 2007 (picture by the author).

superimposing this occupation layer suggests that the village was abandoned and flooded by Kızılırmak (Alkım 1983, Plan III; Schoop 2005, Fig. 8.2). After this interruption, Mound II was re-inhabited (assemblage BB). A still later chronological period is represented on all three mounds and in the saddle between Mounds I and II (assemblage DD/EE). However, it remains obscure whether these four separate areas were occupied simultaneously or the settlement shifted between the mounds. The latest habitation of İkiztepe (assemblage CC) is attested only on Mound II.

The fourth-millennium village at İkiztepe (assemblage DD/EE) comprised one-room free-standing rectangular buildings.[22] Between the houses were situated clay platforms with very large rectangular ovens, sometimes enclosed by a roofed structure (Bilgi 1992, Fig. 2; 1999b, Plan 4; 2001, 33, Fig. 118a–b). Ethnographic parallels for such communal ovenhouses, shared by several households, can be found in contemporary villages in southeastern Turkey (Dodd et al. 2006, 78, Fig. 7; Cutting 2006, 235). It is difficult to find archaeological comparisons for the oversized ovens at İkiztepe. An oven foundation uncovered in a courtyard at the site of Çamlıbel Tarlası near Bogazköy in north-central Anatolia, with its area of 2 x 2.3 m is an apt albeit slightly later counterpart (Schoop 2009, Fig. 54 and 56).

The Black Sea coast of Anatolia is a heavily forested region whose vernacular tradition is dominated by timber architecture. There are two basic and universally found techniques of timber construction in traditional architecture. The horizontal log technique exploits the mass of the timber and not its tensile strength, and utilizes various joints for interlocking the logs. Timber-framed construction, in contrast, exploits the tensile strength of timber according to a "post-and-beam principle" – the beams carry the load and transfer it to the posts (Vellinga et al. 2007, 30). Both construction principles were widely used in the traditional architecture of the Black Sea region of Turkey in the recent past (Fig. 7.5).[23] Observations of burned houses at İkiztepe and Dündartepe suggest that at least some elements of this timber tradition were present during the prehistoric period. The postholes uncovered by the excavators of İkiztepe were never arranged in rows. Moreover, in numerous cases the excavators were able to identify the remains of timber foundation frames and pieces of burnt daub with imprints of wood (Alkım 1983a). Alkım speculates that the walls of the houses were erected on a wooden frame and consisted mainly of timber and mud. Given the large quantities of burned clay, a kind of timber framing filled with wattle-and-daub or rubble appears more likely than a purely wooden structure employing the horizontal log construction (*contra* Bilgi 2001, 33).

More than 690 graves have been investigated on Mounds I and III at İkiztepe. The vast majority of these graves belong to a long-lasting cemetery situated on Mound I that was almost completely uncovered by the teams of Alkım and Bilgi.[24] The excavators date this cemetery to the EBII-III period (Bilgi 2004b).[25] It has been suggested, though, that some of the graves may date to the fifth or fourth millennium BC (Parzinger 1993). Lichter (2008) even put together a group of grave assemblages containing pottery and other characteristic objects that he regards as Chalcolithic (Sk 71, 74, 425, 574, 347, 581 and 246). Unfortunately, the case of the cemetery on Mound I at İkiztepe

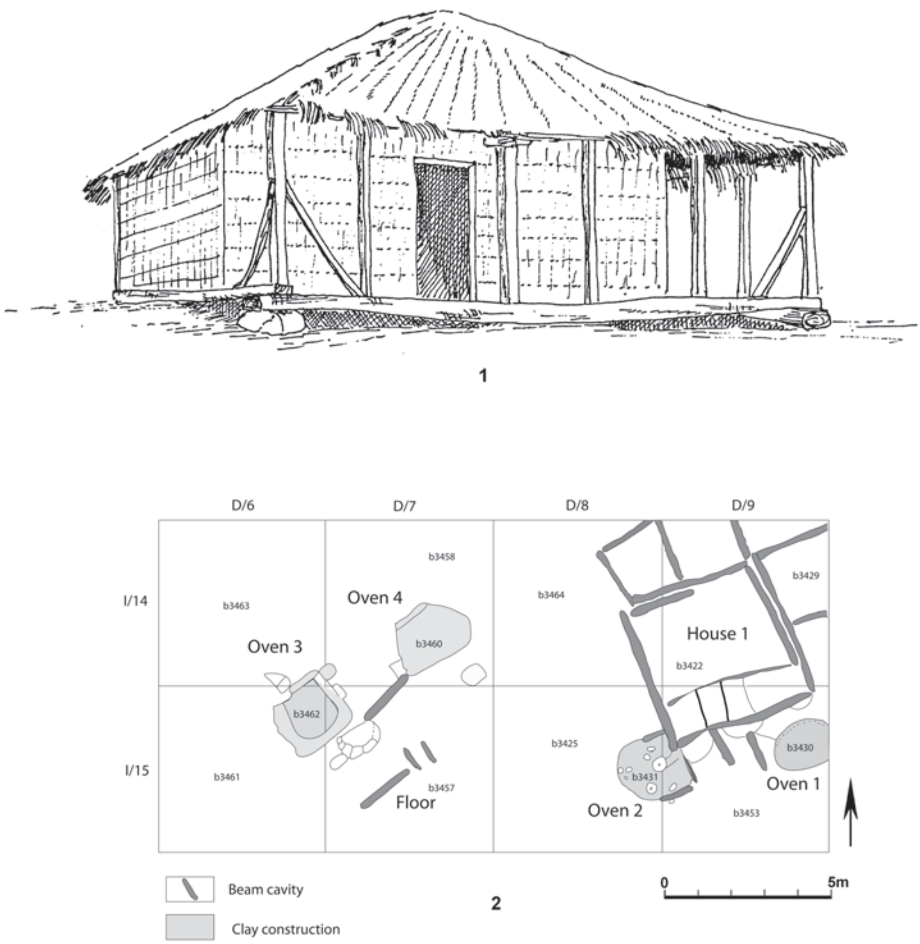

Figure 7.5 Traditional timber house from the Black Sea coast of Anatolia (1) (after Alkım (1983a) and architectural remains at İkiztepe Mound III, Trench L, Level 4 (2) (redrawn from Bilgi 1999b, Plan 2).

is much more complex than suggested by Lichter. In the first place, some of the grave assemblages of Lichter's "early" group do indeed date to the third millennium BC, as their excavators believe. Grave 569, for example, contained two spearheads of arsenical copper. These finds, and in fact all of the more than 100 spearheads found in the graves on Mound I at İkiztepe, clearly belong to Bronze Age types.[26] They are comparable to Types 4 and 5 of Stronach (1957), that is, the spearheads with square or leaf-shaped blades and bent or hooked tangs, a weapon shape dating to the third millennium BC that originates probably from Syria and may derive from the poker-butted spearheads of the Late Uruk and Early Dynastic periods (Stronach 1957, 113–117). The graves with spearheads and those with quadruple spirals, "symbols", complex daggers with cast hilts, and lead "ring-idols", which were in several cases associated with spearheads, should in consequence also date to the third millennium BC.[27]

The alleged association of such third-millennium metal finds with DD/EE-type pottery vessels (see Bilgi 1990, Fig. 20) seems to contradict the fourth-millennium date of DD/EE suggested previously. However, several circumstances cast doubt on the relation between the cemetery and the pottery vessels that have been supposedly found in some of the graves.[28] The stratigraphy of the cemetery is complicated, with some parts of the excavated area displaying a very disturbed stratigraphic situation (for graves disturbing each other see Alkım et al. 2003, Plan 21). Strangely enough, the difference in height between graves uncovered in the same excavation square of 25 m² and containing similar material can reach up to 4 m.[29] Moreover, the graves were cut into a habitation layer of burned houses with whole vessels and other household items, and the grave pits were not in all cases documented during excavation (see e.g. pictures of graves in Bilgi 2004b, Fig. 12 and Fig.13; 2009, Fig. 10). The habitation layer in which the graves were dug produced DD/EE-type material (Bilgi 1992, Fig. 17; 1993, Fig. 11; 2002, Fig. 12). Given that the area was severely disturbed by long-term burial activities, the grave pits have not been identified and excavated separately, and the habitation layer itself contained the remains of burned houses with complete household assemblages (see e.g. Bilgi 2004a, Fig. 9), it cannot be excluded that some of the vessels allegedly found in graves actually belonged to the habitation layer.[30] Thus, while the presence of a large number of graves dating to the third millennium BC on Mound I lies beyond doubt, the exact chronology of the cemetery will remain obscure until the detailed stratigraphic observations of the excavators and the finds, both from the graves and from the habitation layers in which they were embedded, are finally published.

Most of the graves uncovered at İkiztepe contained skeletons in extended supine positions. This burial habit is unusual for an Anatolian prehistoric site.[31] Although evidence about the pre-third-millennium burial habits in central and northern Anatolia is very scarce, it seems that inhumations in a flexed position were the rule. Intramural flexed burials dating to the fourth millennium BC have been revealed in levels 13M and 18M at Alişar, at Çamlıbel Tarlası and in the Chalcolithic strata of Alacahöyük in north-central Anatolia (von der Osten 1937, Fig. 35 and. 44; Koşay and Akok 1966, Pl. 146; Schoop 2010, 192, Fig. 50).[32] Flexed skeletons were also uncovered in western Anatolia, for example at Ilıpınar IV near lake Iznik in the northwestern part of Anatolia, dating to the first half of the fourth millennium BC, and in strata of the later fourth millennium at Kuruçay near Burdur (Roodenberg and Alpaslan-Roodenberg 2008; Duru 2008, 133). During the third millennium BC, too, burial in a flexed position was widely spread in all parts of Anatolia.[33] Thus, the habit of burying the deceased in an extended supine position represents a peculiarity of the coastal region of the Black Sea. A comparable situation has been observed on the western coast, where the cemeteries with extended skeletons of the coastal Hamangia and Varna cultures (dating to the late sixth and fifth millennia BC) clearly stand out from the typical flexed inhumations of the Balkan neolithic societies in the interior (Todorova 1986, 195; Todorova and Vajsov 1993, 224). It has been suggested that the practice of "extended" burial in the west Black Sea was a relic from the preceding Mesolithic period (Todorova and Vajsov 1993, 224).

FOOD, POTS AND METALS

Food Acquisition

Heavy rainfall and mountainous relief are the major limiting factors for the practice of agriculture in the southern littoral of the Black Sea. Ovas (bowl-shaped depressions), the typical agricultural landscape in the interior of Anatolia, are absent; the low coastal strip is extremely narrow, and flat agricultural land with suitable soils is very limited. Moreover, the frequent heavy rains cause leaching and acidification of the thin acrisol cover of the slopes (Höhfeld 1995, 112 f.).[34] Along the humid and rainy Anatolian coast, only several "dry islands", situated in the rain shadow of mountainous promontories or backed by a more open interior, can support mixed farming of the type familiar on the Anatolian plateau.[35] Maize, the traditional staple food on the Turkish Black Sea coast in the recent past, is cultivated in elevations of up to 1300 m. Before the arrival of maize in the seventeenth century, the inhabitants of this region grew broomcorn millet (*Panicum miliaceum*). Millet is very similar to maize in terms of growth and adaptation to poor soils and other unfavourable conditions, for example high humidity (Hütteroth and Höhfeld 2002, 108). Mixed farming in the highlands before the wide spread of cash crops was a combination of maize cultivation and transhumant milk pastoralism. Each household possessed four or five cows and moved with its animals from the village in the valley bottom to the *yayla* (alpine meadows) during early summer to produce butter and cheese for winter consumption (Simonian 2007).

The botanical and faunal evidence from the Black Sea coast of Anatolia is still insufficient for a reconstruction of the farming technology of this region in prehistory. Plant remains from the excavations in Trench B at İkiztepe in 1974–1975 have been studied by van Zeist (Alkım et al. 1988, Table 1). Exact information about the context and nature of these samples, which were associated with assemblage BB, is not available. The samples consisted mainly of hulled wheat (c. 480 grains of emmer and a few grains of einkorn), several grains of a free-threshing wheat, and hulled six-row barley. The only leguminous plant identified by van Zeist was bitter vetch (*Vicia ervilia*). In 1980 and 1981, van Zeist was able to study further soil samples from Mounds I, II and III (van Zeist 2003). Grains of chickpea (*Cicer arietinum*) were identified in a sample associated with assemblage AA, while peas (*Pisum sativum*), lentils (*Lens culinaris*) and grass peas (*Lathyrus sativus*) were present in all periods. Bitter vetch was the most prominent leguminous plant. Moreover, a supply of linseed has been mentioned in this report, although it is uncertain whether it was prepared for consumption or for sowing (van Zeist 2003). A very small faunal assemblage from the excavations in Trench B in 1974 has been analysed by Tekkaya and Payne; it contained bones of cattle, sheep, and pigs (Alkım et al. 1988).

The prehistoric highland communities of the southern Black Sea coast might have been heavily dependent on seasonally available wild resources, since the environmental conditions in most parts of the region do not support reliable grain cultivation. Given the paucity of archaeobiological data, one can only speculate about the wild plant and animal species that were exploited in the highlands. The fruits of the hazel (*Corylus avellana* var. *pontica*) were used here in the recent past as a supplier of fat, together with fish.

Archaeobiological data from İkiztepe, a site situated near the seashore and the bank of Kızılırmak, show that its inhabitants exploited wild foods from the extensive reed-beds, channels, lakes, and flooded forests in the delta of the river. They collected a wide array of wild plants, including fig, grape vine, cotoneaster, hawthorn, barberry, elder, and blackberry (van Zeist 2003). Nutshells of hazels were surprisingly rare among the botanical macrorests (van Zeist 2003, 552). The small bone assemblage from Trench B contained bones of red deer, fallow deer, and roe deer, though most numerous were the bones of wild boars (Alkım et al. 1988). Moreover, water-sieved samples from İkiztepe produced fish bones (Alkım et al. 2003, 176). These results are not surprising, since the wetland forests of Kızılırmak are still an exceptionally rich environment, inhabited by wild boars and thousands of migratory birds, and the delta belongs to the most important spawning grounds of sturgeons and Black Sea sprat (Marushevsky 2003, 162).

Food Storage and Culinary Technology

The burnt houses at İkiztepe did not produce any evidence for larger storage facilities like storage pits, pithoi or clay storage bins. Moreover, stone saddle querns, a very popular tool of early farming technology on the Anatolian plateau, are conspicuously absent at İkiztepe.[36] It is tempting to assume that, already in this early period, the environmental conditions of the Anatolian Black Sea coast brought about specific local strategies for storing and processing staples. Traditional storage of staples for winter consumption in the villages on the humid Black Sea coast of Turkey takes place in storage structures outside the houses. The *serander*, rectangular wooden larders built high above the ground on four large tree trunks, are used to store dry grain, vegetables and fruit (corn, beans, barley, apples and pears) (Simonian 2007, 195). The reason for the absence of saddle querns at İkiztepe remains obscure.

The excavations at İkiztepe revealed numerous domed (beehive) clay ovens. Domed ovens are very wasteful in terms of fuel and heat; on the positive side, they are capable of maintaining high temperatures and storing heat for longer cooking times. A domed oven can be used for moist or dry heat cooking of any kind of food, though only the baking of leavened thick and porous loaves of bread does indeed require this installation (Lyons and D'Andrea 2003, 524). Thus, the ubiquity of large domed ovens may hint at the practices of yeast fermentation and bread baking.

Large jars with openings or small spouts near the bottoms provide indirect evidence for the use of processed milk in the littoral areas of the Black Sea. Such jars belonged to the pottery assemblages BB and DD/EE at İkiztepe and were also found at Dündartepe (Kökten et al. 1945, Pl. LXV, 4; Schoop 2005, Pl. 182, 10, Pl. 183, 22) (Fig. 7.6, 11). Comparable vessels are characteristic of fifth- and early-fourth-millennium ceramic repertory in central and western Anatolia, for example at Çadır Höyük, Büyük Güllücek, Kuşsaray, Yarıkkaya, Beycesultan SC2, and Kuruçay 6A und 6 (Schoop 1998, 2005). The following description in Columella's treatise on agriculture points to the use of such vessels with an opening near the bottom in sour milk preparation: "Drill a hole near the base of a new pot and stopper it with a small stick. Fill the pot with fresh sheep's milk; add a bouquet garnish of green seasonings. [...] After five days, unplug the pot, drain the whey, restopper, wait three more days, drain again. [...] After two more days, drain again, restopper and add ground salt to taste. The product is now stable and the vessel may be sealed until ready for use" (after Thurmond 2006, 192). Schoop (1998) suggested that these peculiar Anatolian jars were used for preparing butter or storing ghee and related the development of milk conservation technology to the colonization of the Anatolian highlands in the late sixth millennium BC.[37]

Weaving

The inhabitants of the prehistoric sites at Dündartepe and İkiztepe used clay spindle whorls and a warp-weighted loom. Spindle whorls dating to the early fourth millennium BC have been reported from the summit trench at Dündartepe (Kökten et al. 1945, 374) and

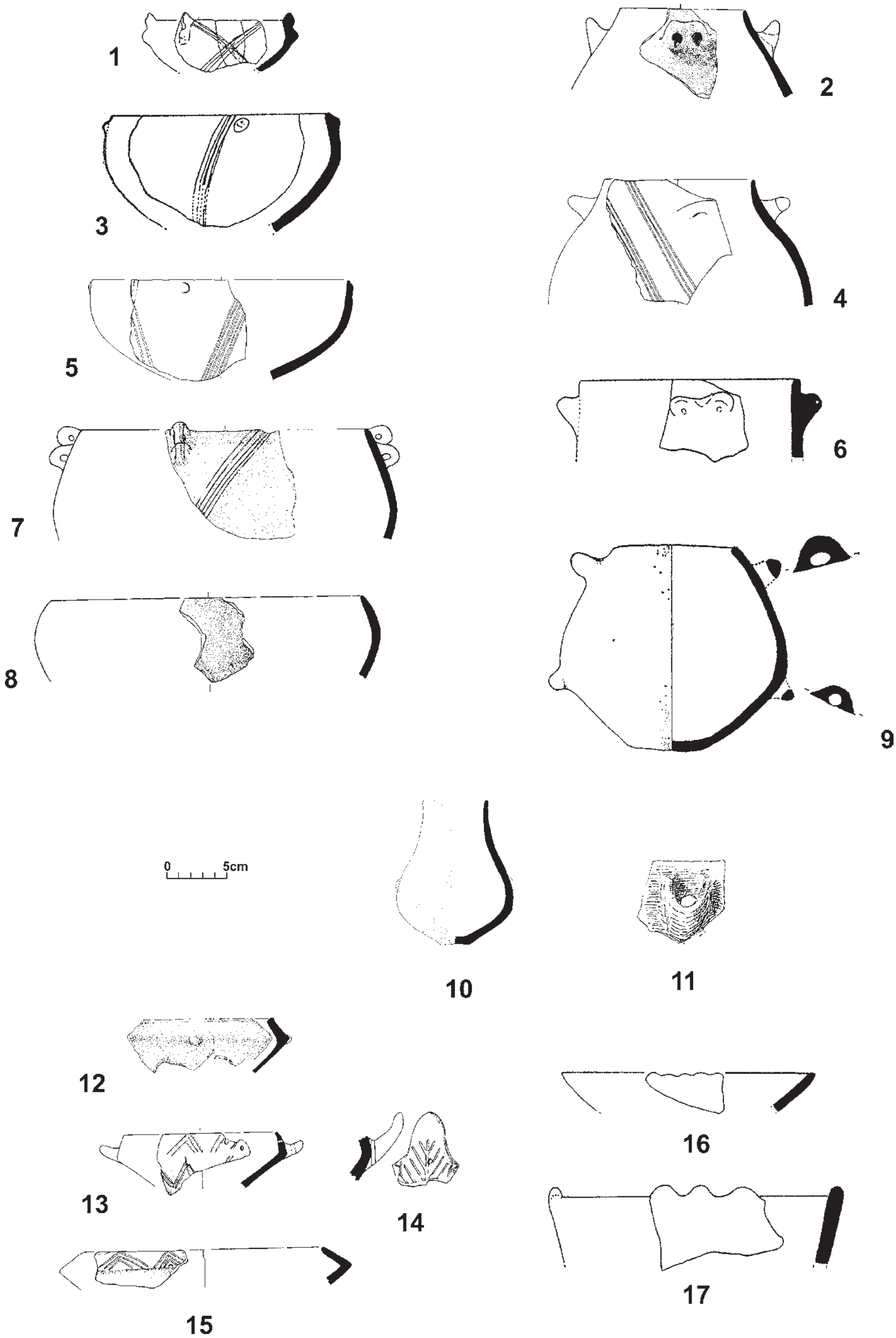

Figure 7.6 Assemblage DD/EE. Pottery vessels from İkiztepe II, Trench B (2.7.8) (reproduced by permission of U.-D. Schoop from Schoop 2005, Pl. 185 and 186, after Alkım et al. 1988), İkiztepe III, Trench J (10.12) (after Alkım et al. 2003, Pl. XXIV, 10, Pl. XXV, 12), İkiztepe III, Trench L (1.3.9.6.16.17) (after Bilgi 1999a, 1999c) and Dündartepe "Summit" (4.5.11.13.14.15) (reproduced by permission of U.-D. Schoop from Schoop 2005, Pl. 186 and 187, after Alkım et al. 1988); (11 not to scale).

from Trenches C and F at İkiztepe (Alkım et al. 1988, Pl. XL, 13, Pl. LV, 2). Conical clay loom weights are frequent finds at both sites. At İkiztepe, loom weights were uncovered in their primary position, for example a complete set of seventy-two weights in a conflagrated building in Trench L (Bilgi 1996, 148, Fig. 11) and ninety-five weights on a house floor in Trench J (Alkım et al. 2003, 51, Plan 12).[38] In both cases, the loom weights may be associated with ceramic material of assemblage DD/EE.

Pottery

The clay bodies of the vessels from assemblage DD/EE at İkiztepe and Dündartepe contained mineral and organic admixtures. Admixtures of crushed shells were nearly absent in the pottery of assemblage DD/EE but frequent in assemblage CC. The division between fine and coarse clay bodies was also more pronounced in the latter (Schoop 2005, 313 f.). The outer surface of many pots from assemblages DD/EE and CC was fired to a dark colour, while the interior was sometimes light coloured. Such colour contrasts must have been produced by placing the vessels upside down and firing them under oxidizing conditions to create red-coloured surfaces; short smudging by covering the fire at the end of the firing operation to restrict oxygen access coloured the exterior surface of the pots black, while the protected interior of the upturned pots retained its red colour (Thissen 1993, 214).

Assemblage DD/EE contained vessels with thin walls and highly burnished surfaces. Some of the vessels were decorated with incised motives and with bundles of thin lines painted with white slip. Also common were relief features like small knobs under the rim and in the widest part of the body, small double lugs or plastic protrusions under the rim, and wavy rims. Assemblage DD/EE included a limited number of vessel shapes – rounded bowls, wide conical dishes, biconical bowls with sharp carinations, holemouth jars, and jars with rounded bodies and high cylindrical necks. However, numerous small elements, like knobs, appliqués, various lugs, protrusions, legs, pedestals, and lids, created an appealing diversity of vessels for displaying, serving and storing food and liquids. Spouts and handles are conspicuously absent (Fig. 7.6). The rich decorations and the numerous additional features, characteristic of the pottery vessels of assemblage DD/EE, disappeared in the later assemblage CC (see Schoop 2005, 314) (Fig. 7.7).

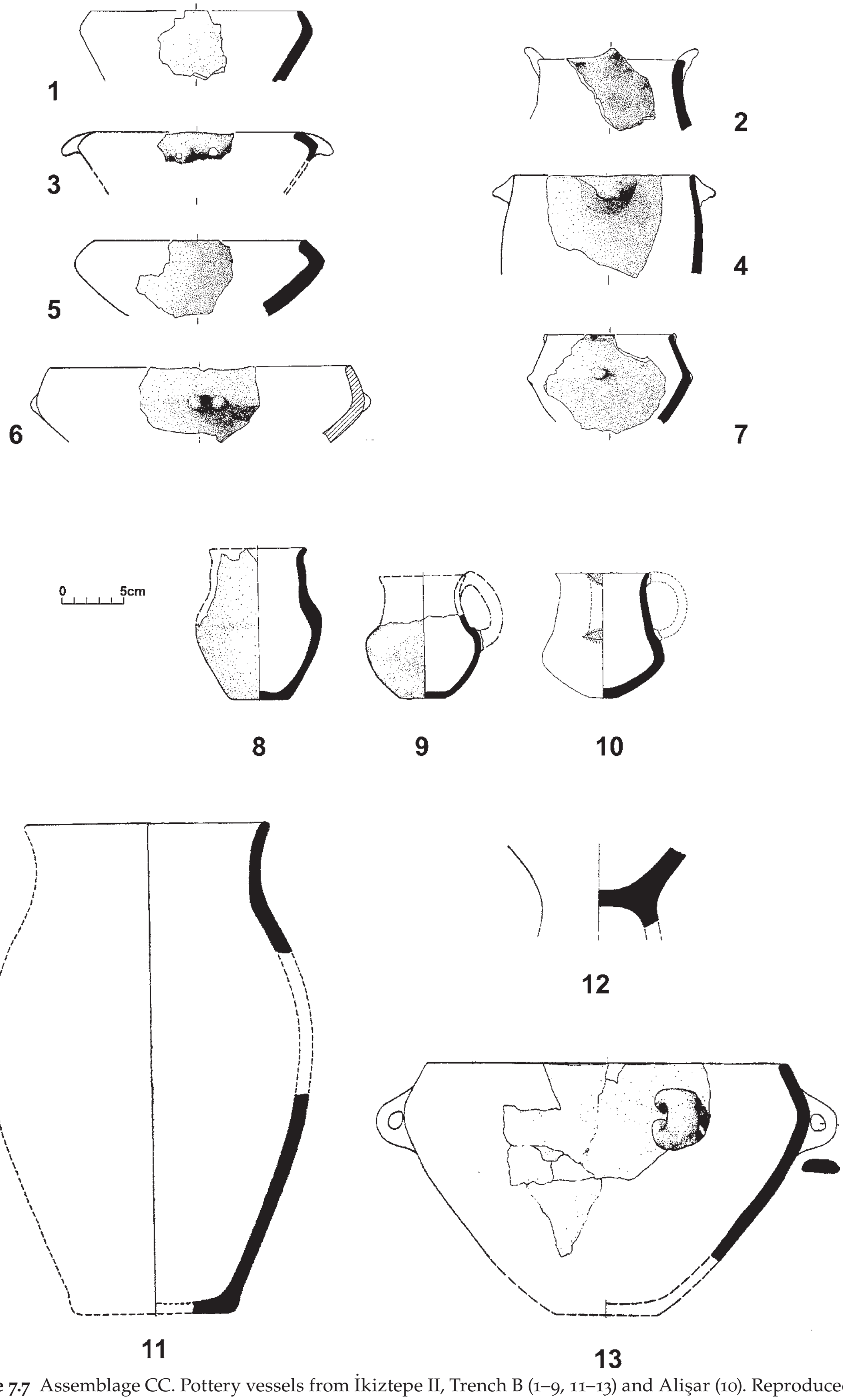

Figure 7.7 Assemblage CC. Pottery vessels from İkiztepe II, Trench B (1–9, 11–13) and Alişar (10). Reproduced by permission of U.-D. Schoop from Schoop (2005), after Alkım et al. (1988).

Metals

The slopes of the Pontic Mountains are rich in mineral deposits and numerous mining sites, and slag heaps attest their intensive exploitation in historical times (Wagner and Öztunalı 2000, 40–50). Traces of prehistoric mining and smelting of copper ores have been reported from two sites in the southern Black Sea: Kozlu and Murgul. At Kozlu, near Erbaa in the Kelkit valley, south of the delta of Yeşilırmak, remains of intensive underground exploitations and large dumps of ore-waste have been dated by charcoal samples from the mine rubble to 4750±30 BP or c. 3600–3500 cal. BC.[39] A site in the vicinity of the mines provided concentrations of burned clay, stone hammers, flint tools, small pieces of slag containing copper droplets, and sherds dating to the Chalcolithic or EBA period (Wagner and Öztunalı 2000, 49 f).[40]

Ancient smelting sites with huge slag heaps have been identified near the large copper deposits at Murgul, south of Hopa. The dumps contained only large slag "cakes" of 1.5–3 kg and never small slag pieces like these at Kozlu. The heavy slag lumps consisted of molten gangue that had solidified on the bottoms of small hollows with diameters of 15–20 cm. The composition and structure of the slags suggested that the oxidic copper ores were smelted at c. 1200°C in reducing atmosphere and attested to the practice of "fluxing", the adding of quartz and iron oxide to reduce the melting temperature of the slag. Judging from the sizes of the imprints on the lower sides of the slag cakes, the copper ingots obtained in one smelting operation weighed only several hundred grams. This technology enabled an impressively efficient separation of metal and gangue and thus the production of estimated 20 t copper in the investigated smelting area of Murgul. The site was dated by ^{14}C to the second half of the fourth millennium BC (Lutz et al. 1994).

During the fourth millennium BC, smelting in the Black Sea region of Anatolia apparently took place near the ore sources. The settlement site at İkiztepe produced very little evidence of copper smelting. The pieces of slagged crucibles from this site, studied by Özbal et al., represent rather the remains of secondary operations (Özbal et al. 2002, 45, Table 3; 2008, 74 f.).[41] They contained high concentrations of arsenic and copper and did not match in composition and appearance either smelting slags or slags from melting and refining operations. Özbal et al. interpreted them as remains of "a sort of cementation", by which they probably meant the adding of pulverized arsenical mineral to molten copper. The majority of the analysed copper objects from İkiztepe contained arsenic (more than 90% of the artefacts; see Özbal et al. 2002). However, the arsenic contents of artefacts associated with assemblages AA and BB hardly reached 1 per cent (Özbal et al. 2002; 2008, 68). Low-arsenic copper was characteristic for the metallurgy at many Anatolian sites dating to the fifth and fourth millennia BC.[42] The casting of metal at İkiztepe is attested by two crucibles found in debris in Level 5 of Trench L that were possibly associated with pottery of assemblage DD/EE (Bilgi 2000, 318, Fig. 7).

Metalworking technology at İkiztepe included the manufacturing of simple items by rolling, bending, and cutting copper wire and sheet. Small copper items like pins with rolled heads, awls, spirals, and hooks appear from the very beginning of the occupation at this site (such items were found together in assemblage AA; Alkım 1983, 31–33, Fig. 1.3). The so-called ring pendants of gold and lead deserve special attention. A gold "ring pendant" has been found on Mound I in possible association with the pottery of assemblage DD/EE (Bilgi 1983, 88; 2001, Fig. 26). This object has close comparisons in the west coast of the Black Sea at late-fifth-millennium sites such as Varna I and Durankulak (see Todorova and Vajsov 2001).[43] The lead pendants from graves Sk 192 and Sk 569 at İkiztepe (Bilgi 1984, Fig. 18, 266; 1990, Fig. 427, the latter associated with a spearhead), however, most likely post-date the fourth millennium BC. Ring-pendants with comparable shapes have been recovered at several Bronze Age sites in Anatolia.[44]

The situation at İkiztepe reminds one of the hoard of gold jewelry from the Burton Y. Berry Collection, which apparently contains ring-idols of both fifth-/fourth- and third-millennium dates (Rudolph 1978). The hoard consists of two separate groups of items that were bought in Trabzon and originate most probably from plundered graves. The artefacts included in the second group date most probably to the fifth millennium BC and were described in Chapter 3 of this book. The first group of objects is later and contains jewelry with comparisons in third-millennium BC southwest Asia and the southern Caucasus. Examples include "boat earrings" from the early Dynastic cemetery at Ur and a somewhat later boat-ring from Kültepe (Maxwell-Hyslop 1971, Pl. 4 and 37); agate "lunate" beads from Trialeti, Tepe Hissar and the Sargonite period at Ur (Maxwell-Hyslop

1971, Fig. 19, Pl. 51; Schmidt 1937, 228); gold "spatula" earrings from a treasure found at Tepe Hissar IIIC (Schmidt 1937, 228); and a spiral ring with "racquet-shaped finals" from Tell Brak (Maxwell-Hyslop 1971, Fig. 24a). This group also contained ring pendants. Their presence among numerous artefacts of the third millennium is either an indication that a specific type of this item was still in use at this time, as was also suggested by the examples cited previously or, less likely, that the objects of the second group of the Trabzon hoard may have originally not belonged together.

The only larger copper tool found at İkiztepe is the flat- axe with a characteristic elongated slim shape.[45] While most finds apparently belong to the third-millennium cemetery, some specimens may originate from fourth-millennium contexts with pottery of assemblage DD/EE.[46] There are several comparable axes from fourth-millennium sites in Anatolia. For example, one such specimen was found in a destruction layer with DD/EE-type pottery in the summit trench at Dündartepe (Kökten et al. 1945, Pl. LXVI, 3). Similar to the finds from İkiztepe in terms of shape and chronology are also the long flat axes from the fourth-millennium graves at Ilıpınar IV and from the settlement Kuruçay VIA in western Anatolia (Roodenberg and Alpaslan-Roodenberg 2008, Pl. 10, 11.12; Begemann et al. 1994; Duru 1996, Pl. 160). Moreover, two comparable flat axes originate from the Chacolithic site at Büyük Güllücek in the northern part of central Anatolia (Koşay and Akok 1957, 47, Pl. 36). An interesting comparison from a distant region offers ten slim flat axes with lengths of up to 28 cm, which were found near Erevan in a hoard together with several pickaxes and probably date to the later part of the fourth millennium BC (Martirosjan and Mnatsakanjan 1973, Fig. 47; Munchaev 1975, Fig. 83). Furthermore, similar elongated flat axes have been reported from the mid- and late-fourth-millennium graves at Sé Girdan near lake Urmia, from the Chalcolithic site of Shiqmim and the fourth-millennium hoard of Nahal Mishmar in the Levant, and from the late Uruk site Habuba Kabira on the Upper Euphrates (Muscarella 2003, Fig. 5; Bar-Adon 1980, No. 164–169; Levy and Shalev 1989, Fig. 2, 3; Tadmor et al. 1995, Fig. 26 and 27; Strommenger 1980).

Several tanged daggers were recovered in graves at İkiztepe, some of which reportedly contained ceramic vessels with parallels in assemblage DD/EE (see Bilgi 1984, 1990). The exact chronology of these finds, however, remains uncertain. It seems very likely that most or all of the tanged daggers from İkiztepe date to the third millennium BC.[47] These artefacts differ significantly from the early daggers of Anatolia, which were hafted by means of a plate and rivets and not a tang (e.g. at Ilıpınar IV and Çamlıbel Tarlası, dating to the second half-middle of the fourth millennium BC; Roodenberg and Alpaslan-Roodenberg 2008, 319, Fig. 8, 5.7, Fig. 12, 6–8; Schoop 2009, Fig. 61).[48]

BETWEEN CENTRAL ANATOLIA AND SOUTHEAST EUROPE

The villages in the southern Black Sea littoral are isolated both from each other and from the interior of Anatolia by extremely rugged terrain. The promontory of Sinop, for example, lies behind the Küre dağları, a mountainous wall reaching 2019 m, which effectively hinders contacts between the coastal area and the interior. Since land routes are very difficult to travel, coastal communities in the southern Black Sea are oriented mainly toward the sea (Hütteroth and Höhfeld 2002, 116). Throughout history, the Black Sea littoral remained a far-off, marginal region for the inhabitants of the Anatolian plateau. The courses of the rivers flowing into the Black Sea are "barriers, not natural highways", and present-day routes of transportation avoid their deeply cut, impenetrable gorges (Burney 1956, 179). It has been suggested that the valley of Kızılırmak served as a major route of communication between the coast and the plateau (e.g. Bauer 2007, 229). However, even today there is no road across the mountains following this valley. The deltaic plains in the central part of the coast indeed have the best geographical connection to central Anatolia, though not through the steep gorge of Kızılırmak but through passes in the lower middle section of the Pontic Mountains (the "Gate of Kavak") (Höhfeld 1995, 118). The next major break in the mountain barrier is situated near Trabzon and enables transition through the pass of Zigana to the eastern part of Anatolia and west Iran.

Relationships with the interior of Anatolia were maintained throughout the İkiztepe sequence. Assemblage BB of the fifth millennium BC finds close comparisons among the pottery from Büyük Güllücek and Horoztepe, for example the characteristic carinated bowls, horn handles, spouts, white painting, and incised and white-filled decorations (Orthmann 1963, 20/06; Schoop 1998; 2005, Pl. 9, Pl. 10). Parallels to some elements of assemblage DD/

EE, for instance the red-black surface contrast and some characteristic shapes, like jars with knobs and cylindrical vessels, are present at Alacahöyük and Horoztepe (Schoop 2005, Pl. 6, 4.11; Orthmann 1963, 20/05), while assemblage CC resembles the pottery of Alişar (Schoop 2005, 331 f., Pl. 3, 1). Artefacts and materials were certainly exchanged between the inhabitants of the coast and the highlands of northern and central Anatolia, as demonstrated by finds of obsidian at İkiztepe (Alkım et al. 1988, 157, I/74–189 and I/74–278, 159 I/74–74) and sea shells at Çamlıbel Tarlası near Boğazköy (Schoop 2010, 198).

Moreover, prehistoric pottery in central and northern Anatolia shares several peculiar traits with finds from the Balkans and the Aegean. The similarity between the "horned" handles and the decoration of incised dotted bands at series of late-sixth and early-fifth-millennium sites from north-central Anatolia (Büyük Güllücek, Gelveri, Güvercinkayası, İkiztepe BB), the east Aegean coast (Tigani II-III), Thrace (Karanovo IV and Paradimi), and the central Balkans (Vinca B-C) is striking.[49] In the material from the later fifth millennium BC, such similarities are still recognizable but much

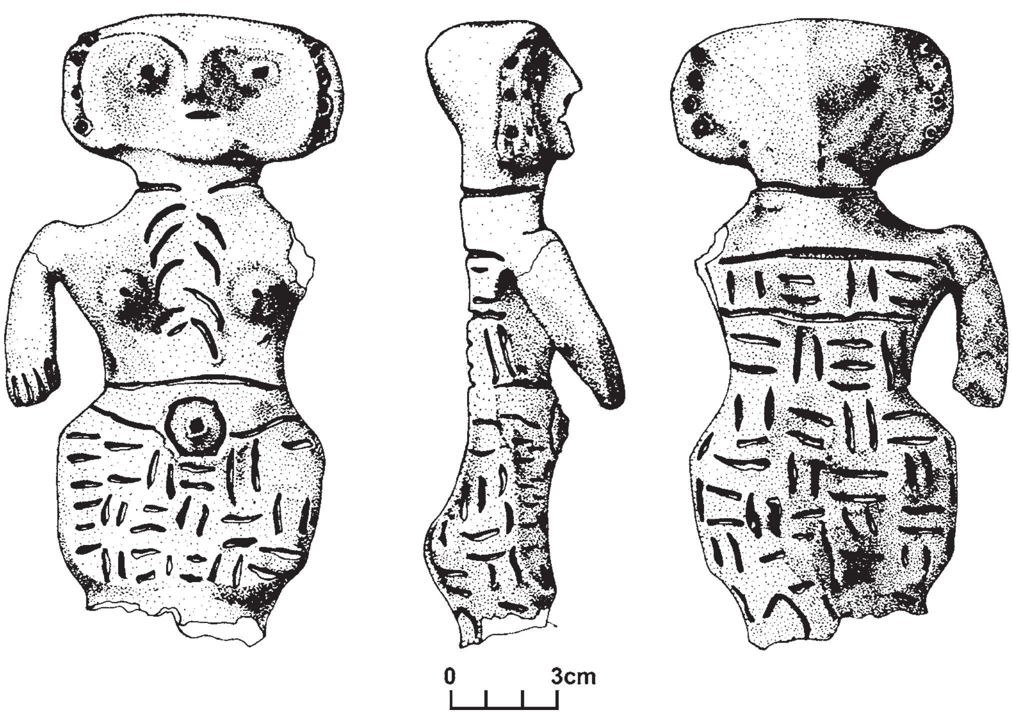

Figure 7.8 A clay figurine from İkiztepe II, Trench B, Assemblage DD/EE. After Alkım et al. (1988, Pl. LVI, 1).

less compelling. For example, Thissen (1993, 217) compared carinated bowls with inverted rims and incised and encrusted decorations of the Karanovo V–VI period in Thrace with pottery finds from İkiztepe (assemblage DD/EE) (Fig. 7.8). Items from the Trabzon hoard and a gold ring-pendant from Mound I at İkiztepe provide further parallels with the east Balkans (Rudolph 1978; Bilgi 1983, 88; 2001, Fig. 26). Özdoğan (1996, 195) drew attention to the most conspicuous feature of these analogies between northern Anatolia and the Balkans – their complete difference from the material of Syro-Mesopotamia and the Levant. It seems possible that the emergence of a vast interaction sphere encompassing southeast Europe and Anatolia north of the Taurus range in the course of the sixth and fifth millennia BC coincided with an episode of spreading metallurgical knowledge and innovations such as the smelting, melting, and casting of copper (see Chapter 8).

Pottery evidence suggests that during the fourth millennium BC interaction inside the Balkan–Anatolian zone declined gradually, while connections between the Anatolian plateau and the east Anatolian highland grew in importance. The main indication for contacts provides the spread of a specific ceramic ware with red outer and black inner surfaces. This red-black burnished (RBB) ware constitutes one of the three major ceramic styles in Anatolia during the fourth millennium BC, the other two being the chaff-faced ware of late Ubaid-Uruk type in east Anatolia and the hand-made wares of west Anatolia (see Schoop in press).

In central Anatolia, red-black pottery dating to the fifth millennium BC has been reported from Yarıkkaya, İkiztepe, Alacahöyük, Çadır Höyük, and Alişar (Schoop in press). During the fourth millennium, the distribution area of this peculiar ceramic ware expanded in two directions. On one hand, it became very popular on the Black Sea coast at İkiztepe (assemblage CC). On the other hand, red-black ceramics appeared in eastern Anatolia. At the site of Arslantepe on the Upper Euphrates, for example, red-black pottery of apparent central Anatolian origin emerged at the end of phase VII around 3500 BC (Frangipane and Palumbi 2007, 2008). Red-black ware accounts for less than 2 per cent of the pottery assemblage at Arslantepe VII and was clearly intrusive. Differences concern the clay body, which is grit-tempered in contrast to the local chaff-tempered ware of the Upper Euphrates, the shapes, and the specific firing technique that produced the red-black colour contrast between the inner and outer surfaces. Red-black ware also was present in the upland regions of east Anatolia, for example at Sos Höyük near Erzurum, around 3500 BC. Frangipane and Palumbi (2007, 253) speculate that the spread of this peculiar ceramic ware may mark the intensification of contacts between the Euphrates basin and the mountainous regions of the Black Sea, probably in the context of supply with metals.

8

Conclusions: The Black Sea and the Outside World

> Ocean people are different from land people. The ocean never stops saying and asking into ears, which don't sleep like eyes.
>
> Maxine Hong Kingston (1940–), *China Men*

PEOPLE OF THE BLACK SEA

The Black Sea coastland in the fourth millennium BC was a region of remarkable cultural diversity. In the northeast, the inhabitants of the lower Kuban dwelled in unplanned villages comprising scattered light round huts. Their cemeteries, in contrast, were impressive. Feasting and food-sharing were crucial parts of most burial ceremonies and the funerals of some individuals provided settings for very large social gatherings accompanied by animal sacrifices, the consumption of significant amounts of food and the construction of huge earth and stone burial mounds. The ethnographic record offers numerous examples for such lavish funeral feasts being sponsored by the family of the deceased as a demonstration of its political power. In many societies, the generous funeral feast is a crucial means of showing economic superiority, attracting allies and intimidating competitors.

It has been argued previously that the surplus for financing the ceremonies in the valley of the lower Kuban must have been provided by intensive animal herding rather than cultivation. Despite their taste for weapons and symbols of violence, it seems that the communities in the north Caucasus were not troubled about the security of their villages. Neither fortifications nor other defensive measures, such as inaccessible topographic positions or settlement nucleation, are characteristic for this period. Warfare was apparently not a major threat for the domestic realm, and, alternatively, the control over habitation sites and stored bulky agricultural produce was not a special concern. Thus, the command over pastures, animals and trading expeditions appears to be a more likely source of surplus (and cause for conflicts) than the direct control of cultivable land and agricultural produce. The surplus was devoted both to direct consumption (feasting) and to diacritic objects and practices (exotic substances, clothing and ornaments). The imposing mounds of prominent individuals were probably the clear landmarks of their families' control over a territory, while the exotic habits, luxurious clothing, extraordinary bodily decorations, rare objects, foodstuffs and substances that were displayed and buried during the funerals effectively demonstrated the concentration of political power. This culture of display and competition surrounded the adoption and financing of a series of complex technical innovations in the north Caucasus around the middle of the fourth millennium BC. During its climax, the influence of the north Caucasian material culture reached the steppe areas in the northwest Caspian region, the lower Don and in the Crimea.

The grasslands north of the Sea of Azov and the Black Sea were the setting of a quite different lifestyle. The dispersed population of this region occupied short-lived settlements situated on riverbanks with access to the floodplain. The communities comprised only several households, dwelling in structures with light walls and a subterranean floor. It seems possible that the sites in the valleys functioned as cold-season habitations in a bi-seasonal settlement system. The economy of the steppe communities involved both wild resources and domestic crops and animals. Farming, together with the standard equipment of antler hoes, sickles and saddle querns, was apparently adopted from the inhabitants of the forest-steppe zone in the west. Apart from the position of the body and some minor differences in the construction of the mound, burial customs were quite uniform throughout the coastal plains. The burial sites comprised a few small mounds and the graves contained only a limited number of simple artefacts. Thus, the mortuary evidence supports the impression of small dispersed and rather egalitarian communities, conveyed by the habitation sites. This lifestyle, which stands in clear contrast to the larger population concentrations in the north Caucasus, limited the possibilities of recruiting larger working parties and the incentives for social display, and promoted little interdependence between the communities. The modest material culture and restricted long-distance contacts of the steppe inhabitants were coupled with an unsophisticated and conservative technological tradition.

Around the middle of the fourth millennium farmers from the interior established new communities along the shores of the estuaries and lakes in the coastal grasslands northwest of the Black Sea. The newcomers did not exploit the sea for subsistence or communication but remained connected to the rivers and to the interior of the country. Their economy was similar to that of the forest-steppe inhabitants, though their village tradition diverged. The predominance of small and shifting settlements in the coastal zone was possibly a consequence of the specific ecological conditions. Generally, the lower moisture in the steppe areas leads to reduced yields of following crops and a need for more frequent changes of cultivated plots and longer fallow periods in comparison to forest-steppe environments. Thus, the climate limits both the possibilities for long-term habitation and the growth of the communities. Only a few habitation sites of the Usatovo period developed into nucleated villages. The extraordinary status of these large communities was reflected in their cemeteries. In the central sites, the possibilities for accumulating wealth and influence seem to have been open to more than a few individuals and families. The inhabitants of Usatovo, for example, constructed series of large barrows associated with monumental stone features, remains of funeral feasts, and graves containing outstanding artefacts. The system of several central social groups and a large number of small unstable communities accommodated a technological tradition which did not significantly differ from its counterparts in the forest-steppe zone of southeast Europe. Among its hallmarks were the technology of painted kiln-fired table ceramics and the manufacturing of larger copper artefacts by casting and hot-working. The long-distance contacts of the coastal inhabitants were oriented mainly toward the Dnestr-Carpathian region, as suggested by the imports of copper and flint.

The remaining parts of the Black Sea littoral are poorly explored. The coastland south of the Balkan Mountains was dotted with agricultural villages which possibly played an important role in the communication between the Anatolian and the European parts of the sea. The Anatolian coast, a remote upland region effectively isolated from the interior by a major mountain chain, offers only a few lowland areas suitable for farming. Small nucleated villages and hamlets on low natural elevations predominate among the identifiable sites. Village life and farming in the lowlands of the coast resemble the practices in the Anatolian interior but have their peculiarities, for example the traditions of timber architecture, communal ovens, and burials in an extended position on the back. The upland region stands out with its developed mining and smelting sites. The easternmost part of the Anatolian coast and the subtropical wetlands of Kolkheti represent a virtually unexplored area, but the major mining and smelting centre at Murgul near Hopa and the hoard of Balkan and Caucasian jewelry allegedly found near Trabzon suggest the existence of coastal centres that are yet to be identified and studied.

TECHNOLOGICAL DEVELOPMENTS IN THE BLACK SEA COASTLAND

Farming

Farming technology arrived in the coastal regions of the Black Sea from the interior of Anatolia, the Balkans and the south Caucasus during the later centuries of the sixth millennium BC. In the northwestern and northern parts of the littoral, the dispersal of farming took place largely by contacts with the indigenous people and not by direct colonization. Wider adoption of cultivation and animal breeding in the north Black Sea littoral is attested in the early fifth millennium BC (Chapter 3).

Hulled wheats, a domestic crop that is easier to store with simple means and has superior nutritional qualities in comparison to the "naked" species (see Nikolova and Pashkevich 2003, 90), predominated in the archaeobotanical record from the Black Sea coastlands.[1] Naked wheats were a crop of secondary importance: imprints of hexaploid free-threshing wheat (possibly hexaploid bread wheat, *Tr. aestivo-compactum*) were identified at Majaki, Usatovo and Purkary (Patokova et al. 1989, 118; Jarovoj 1990, 259). Beside the founder crops of wheat, barley and pulses, early farmers in the Black Sea steppes grew one further cultigen which did not belong to the Near Eastern "package" – broomcorn millet (*Panicum miliaceum*), whose natural habitats are in central and eastern Asia.[2] Millets have a very short growing season (sixty days from sowing to harvesting) and are very hardy. They grow on poor soils, resist heat, and tolerate very dry or too humid conditions (Zohary and Hopf 1988, 76). On the negative side, their seeds usually contain less protein than wheat. The earliest evidence for the cultivation of broomcorn millet comes from northern China and dates to the eighth millennium BC (Lu et al. 2009).[3] The dispersal of millet cultivation along the steppe belt of Eurasia in the sixth millennium BC appears very plausible.[4]

Culinary Technology

Katz and Voigt (1986, 25) observed that reliance on domestic species negatively affected the use of seasonal wild food. As plant diversity decreased, however, more elaborate processing techniques became necessary to extract a maximum of nutrients from the limited resources. For example, the technology of lactic acid bacteria fermentation seems vital for cereal diets. Since calcium and iron absorption from grain foods is inhibited by the presence of phytic acid in the bran, diets based mainly on whole-grain meals can lead to severe deficiency diseases like anemia and rickets (Thurmond 2006, 16). The acid environment created by lactic acid bacteria (LAB) fermentation activates phytate-degrading enzymes and thus significantly enhances the nutritional value of cereals (Sahlin 1999, 15 f.).[5] LAB takes place both in cereal porridges and in bread doughs left exposed to air due to the presence of a mixed symbiotic culture of air-borne yeast and lactic bacteria. Consumption of milk as a dietary staple is also virtually impossible without the biotechnology of LAB fermentation that converts the indigestible lactose into harmless lactic acid and simultaneously turns the fast-spoiling fresh milk into a microbiologically stable product.[6] Recent analyses of absorbed organic residues from pottery substantiate the hypothesis that cereal cultivation, ruminant breeding and the practice of milking spread into western Anatolia and southeast Europe as a technological cluster during the seventh-sixth millennium BC (see Chapter 3).

There is only indirect evidence for the use of processed foods such as butter, sour milk or leavened bread in the littoral areas of the Black Sea. The peculiar jars with openings near the bottoms from İkiztepe and Dündartepe seem suitable for milk processing, particularly in the preparation of sour milk by LAB (see Chapter 7).

Furthermore, the large communal domed ovens at İkiztepe may have been constructed for baking thick loaves of leavened bread.

In comparison to LAB fermentation, alcoholic yeast fermentation seems more a "biological ennoblement" than a necessity. Some varieties of alcoholic beverages are classified as a special type of food and may play a significant role in nutrition. The main importance of alcohol, however, resides in its psychotropic properties. Alcoholic beverages are a highly valued ritual commodity and a "fundamentally important social, economic, political, and religious artifact" (Dietler 2006, 229).[7] The oldest direct evidence for the technology of alcoholic fermentation of grapes and cereals comes from Iran and the southern Caucasus and dates to the fourth millennium BC, while research on the genetic diversity of *Saccharomyces cerevisiae,* the yeast species involved in most processes of food fermentation, suggests that most domestic strains of wine yeast originate in southwest Asia (Legras et al. 2007; see also Chapter 4).[8]

As Sherratt (1997a, 396) rightfully points out, alcohol may have been rather difficult to obtain in temperate Europe, including the Black Sea. Since the sugar content of native wild fruits in the temperate zone is too low for direct fermentation, honey may have been indispensable for making alcohol in prehistory. Honey has always been a very expensive commodity, even after the development of large-scale beekeeping during the Middle Ages, and mead (a mildly alcoholic drink of fermented honey) was a luxury to be consumed at the courts of kings (Koch 2003, 135). Intriguingly, extravagant consumption of honey-based alcoholic drinks may explain the function of the vessels of precious metals in the northeast Black Sea (Chapter 4). Particularly striking is the combination of a copper bucket and silver cups in the kurgan of Maikop. Bronze Age bog finds from Denmark consisting of large bronze buckets accompanied by gold cups, which are widely considered as table sets for serving and drinking mead, offer an apt parallel (Koch 2003). Other indirect evidence for the consumption of alcohol, such as the sudden appearance of pouring vessels and drinking sets, is absent in the pottery repertory of the Black Sea communities.

Textiles

While early plant cultivation involved the growing of fibre plants, animal breeding initially did not provide raw materials for the textile crafts. Since the wild progenitors of sheep are neither woolly nor white, the change in structure and colour of the hair cover must have appeared by means of selective breeding after domestication (Ryder 1969). Osteological evidence from southwest Asia and Europe suggests the appearance of a new large sheep race in the fourth millennium BC (Boessneck and von den Driesch 1992, 67; Benecke 1994, 138; Bökönyi 1979, 103 f). Moreover, genetic research on feral and semi-feral sheep in peripheral areas of Europe (Sardinia, Corsica, Cyprus, and Northern Europe), which are considered relicts of the initial domestic sheep population, showed that they differ from modern woolly sheep breeds. It also suggested that the area of origin of the modern woolly breeds was in southwest Asia (Chessa et al. 2009). While neither the genetic nor the osteological data relate directly to sheep woolliness, they seem to indirectly substantiate the hypothesis that the "improved" woolly race developed in southwest Asia and dispersed to Europe some time after the adoption of farming, most probably in the fourth millennium BC. When and where exactly the selective breeding of woolly sheep first took place remain questions for future research.

The selection of woolly races opened completely new avenues for the weaving craft. On one hand, the growing, harvesting and processing of animal fibres are less labour-intensive in comparison to bast fibres (see Barber 1991). Moreover, wool fibres have scaly and sticky surfaces which are better suited for weaving patterns with fewer interlacings of the threads in comparison to tabbies and thus have a softer, pleasant texture. Another advantage of white wool over bast fibres is its ability to easily absorb dyes in bright and appealing colours (while bast fibres are difficult to dye but easy to bleach) (Barber 1991, 21).[9] The availability of high-quality wool may have triggered the development of complex weaves for example different types of twills, while the ability of animal fibres to easily absorb dyes in bright and appealing colours may have been essential for the development of elaborate techniques of textile decoration (Broudy 1979, 45; Barber 1991, 211).

The selection of woolly breeds in southwest Asia was apparently completed by the early fourth millennium BC. Archaeozoological evidence from northwestern Iran and lower Mesopotamia attests that significant adjustments in the herding strategy, for example an abrupt change of the sheep-to-goat ratio in favour of sheep and an increase in the number of mature sheep, took place around

4000–3600 BC (McCorriston 1997, 521; Payne 1988, 105). At Arslantepe in the Anatolian highlands, a sudden increase in the numbers of sheep was recognized at the transition from phase VII to phase VIA around 3500 BC (Bökönyi 1983, 592 f.). Moreover, at several sites in eastern Anatolia archaeozoologists detected the appearance of more robust individuals among the sheep in the second half of the fourth millennium BC, perhaps suggesting the introduction of a new breed. The new robust animals were predominantly male and resembled more closely the unquestionably woolly large race of the Bronze Age than the small "neolithic" sheep (Boessneck and von den Driesch 1992, 67). The oldest secure remains of wool textiles originate from Shahr-i Sokhta I, dating to the last centuries of the fourth millennium BC (Good 1999).

The situation in the Black Sea is comparable, with the textile remains from Novosvobodnaja in the north Caucasus dating around 3000 BC. Unfortunately, the faunal data from this region are too limited to provide any clues about the sheep breeding practices in the fourth millennium BC. On the lower Dnepr, however, large and robust sheep appear in the bone assemblages from the lower and middle levels of the site Mikhajlovka. These animals were rather different from the smaller "neolithic" breeds of the Tripolie communities in the forest-steppe zone. Thus, while the exact ways of dispersal of the woolly sheep remain unclear, a northern route across the Caucasus and into the steppe cannot be excluded.

Ceramic Technology

Like domestic animals and plants, pottery-making spread into the coastal regions of the Black Sea in the later sixth millennium from the interior of Anatolia, the Balkans and the southern Caucasus. The steppe region north of the Black Sea, however, was an exception in this respect. The conical vessels with pointed bottoms and combed, incised and stamped decorations that appeared here in the sixth millennium did not derive from the pottery-making tradition of southwest Asia and the Balkans. Dolukhanov et al. (2005, 1456 f.) point at the evidence for a very early appearance of pottery along the southern edge of the boreal forest in Eurasia and suggest that pottery-making spread into the east European Plain from this area. The starting point was most probably an independent centre of invention in the southern part of eastern Siberia, where comparable pottery of the so-called Ust-Karenga complex has been recently dated to 11.800–11.100 cal. BC (Kuzmin 2002, 41, Fig. 7).[10]

Metals

In recent decades, the origin and development of metal smelting and casting in the Old World began to resolve. Schoop (1995, 40 f., 51 f.) argued convincingly that the inception of smelting did not necessarily involve a radical conceptual or technological breakthrough. Some copper minerals are easy to smelt at about 400–500°C without specialized technological skills and equipment. The oldest evidence for smelting malachite at sites like Tal-i Iblis and Değirmentepe in eastern Iran and on the Upper Euphrates dates to around the end of the sixth millennium BC (see Chapter 4). Malachite smelting began simultaneously in the Balkans in the last centuries of the sixth millennium, as attested by slags found at Belovode (Borić 2009).[11] In contrast to smelting pure copper oxides and carbonates, the innovation of melting and casting was associated with a crucial technological threshold. The successful melting and casting of larger amounts of copper require the skills of maintaining very high temperatures under reducing conditions (the melting point of pure copper is 1083°C) and the ability to produce and handle refractory materials that can hold the weight of the molten charge.[12] Moreover, the innovation of casting was possible only after the fall of one major conceptual barrier. Unlike all previous practices, casting involves handling the metal as a liquid material and a manufacturing approach entirely different from those applied to most other raw materials (the principle of replication) (Lechtman 1999, 224). The casting of larger copper artefacts began nearly simultaneously in the second quarter of the fifth millennium BC in southwest Asia and in southeast Europe (Yalçin 2000b; Todorova 1999, 237, Fig. 4).[13]

The use of native copper and malachite was adopted by the inhabitants of the Black Sea together with the practices of farming in the late sixth millennium BC.[14] In the course of the next millennium, copper smelting and casting were added to the metalworking practices in the coastlands. At the time, only the communities on the west coast had a good command of the techniques of casting and shaping heavy copper tools and of working gold (Todorova 1999; Ryndina 1998). In contrast, the techniques of casting small pre-forms, shaping by hot-working and finishing by cutting, piercing, and rolling were widely spread in the entire Black Sea region. Trinkets like rolled beads, spirals, pendants, appliqués, bracelets, hooks, and pins are common among the copper finds from all parts of the littoral (Ryndina 1998; Özbal et al. 2002).[15]

While the "trinket" tradition in copper metalwork continued in the grasslands north of the Black Sea without significant changes into the fourth millennium BC, other parts of the littoral underwent dynamic development after 4000 BC. Striking is the evidence for the practice of fluxing from the copper mining area of Murgul near the southeastern Black Sea coast (see Chapter 7). The metallurgists of Murgul facilitated the separation of gangue and metal by intentionally adding quartz and iron oxide to reduce the melting temperature of the slag. This advance enabled the smelting and separation of metal from gangue in one operation and thus the very efficient production of metal on a nearly industrial scale. The amount of copper produced during the exploitation of the smelting sites at Murgul around the middle of the fourth millennium was more than 20 t.

Furthermore, in the course of the fourth-millennium arsenical copper almost completely replaced unalloyed metal in all parts of the littoral except the northern grasslands. But while the communities on the western and northwestern coasts merely advanced their traditional metalworking techniques, the inhabitants of the north Caucasus experienced a veritable revolution in the processing of precious and base metals. The basic principles of copper-base metallurgy from smelting and melting to casting and cold-hammering of larger objects appeared here around the middle of the fourth millennium BC without a preceding phase of development. Together with these widely spread techniques, the north Caucasian metalworkers adopted several extraordinarily sophisticated innovations such as the working of silver and gold, the preparation of different alloys of base and precious metals, the use of clay two-partite moulds, the technique of lost-wax casting, and the manufacturing of sheet metal vessels.

Transportation

Another area of technological innovation during the fourth millennium was animal traction. The technology of animal-powered traction exploits the complex interplay between harness, animals and vehicle. Crucial for its performance is the harnessing system, designed to link the animals to the work implement and enable them to pull the load with maximal draught power. In tracing the origins of animal traction, archaeologists often overlook the existence of independent systems of harnessing and traction with separate histories of development. Above all, there is a principal difference between single and pair draught.

The shaft-draught system for harnessing a single animal, as observed by Littauer and Crouwel (1979, 9), may well have developed by hitching animals to the travois, a vehicle made of two parallel poles connected by a frame. The poles can be easily dropped on both sides of a draught animal and attached by means of straps over the back and in front of the chest. The advantage of the shaft-draught system lies in its flexibility and maneuverability; apart from the travois, shaft draught is suitable for implements which have to turn in a tight circle, for example threshing sledges – a system which is obviously depicted on three sealings from Arslantepe VIA and on an unprovenanced steatite plaque of the late Uruk period (Frangipane 1997, 64 f., Fig.16; Littauer and Crouwel 1979, Fig.2). Clay models of sledges with runners and animal head protrusions on the front sides from sites of the Tripolie B2 and C1 periods in the forest-steppe zone of Dnepr may also represent threshing and transport sledges drawn by single animals, hitched by means of straps and shafts (see Chapter 6).

Harnessing by means of shafts, ropes and straps is poorly suited for heavy transport and tillage. Hitching only one animal wastes the gain of mutual reinforcement in a team and provides only insufficient traction power. If the single-hitched animal works hard, it can achieve the performance of a pair, though only with a very unfavourable outcome (Starkey 1989, 28).[16] There is one classical system for hitching a pair of animals walking side-by-side, the pole-and-yoke draught system, which remains in use in animal-drawn tillage and transport to the present day. This exceptionally successful draught system must have emerged under rather specific circumstances, whose reconstruction still remains a matter of pure speculation. Childe (1955, 210) has suggested that the natural form of the ard was the basis for the development of paired draught by means of a pole, a conjecture that appears quite plausible. In addition, Sherratt (2006, 343) speculated that the raison d'être of the first animal-drawn ards was not tillage but rather the mechanization of furrowing in large-scale irrigation systems based on dendrite canals. If the insightful conjectures of Childe and Sherratt are correct, then irrigation farming maintained by the giant urban centres of fourth-millennium BC south Mesopotamia appears to be one of the most likely contexts of origin for the paired-draught system.[17] The pole-and-yoke "engine" was an essential precondition for the development of heavy wheeled vehicles; while the exact area of origin of wheeled transport remains far from clear, the innovation must have arisen among people who were well familiar with paired draught and with all associated practices of animal training and implement construction, probably near the area of origin of paired draught itself.

The archaeological record in the northern Black Sea region provides little evidence for the use of paired draught or wheeled vehicles before 3000 BC. Wheels found in graves at two sites on the lower Kuban and the lower Don, dating to the later centuries of the fourth millennium BC, belonged most probably to four-wheeled heavy wooden wagons comparable to the typical vehicles of the third-millennium BC Jamnaja culture. Whether wheeled transport arrived at the Caucasus from Greater Mesopotamia remains uncertain. Certainly, the wagon pictogrammes inscribed on clay tablets of the late Uruk and Jemdet Nasr periods at Uruk-Warka belong to the earliest indications for four-wheelers in the Middle East. However, such early evidence is not limited to Mesopotamia. Clay models of two-wheelers dating to the second half of the fourth millennium BC have been reported from sites in central Asia and the Indus valley (see Bakker et al. 1999, 778, Fig. 2, with references; Kircho 2009; Kennoyer 2004, 90 f., Fig. 2). Keeping in mind the central Asian imports and influences in the material culture of the north Caucasus discussed in Chapter 4, we cannot rule out the possibility that wheeled vehicles reached the Caucasus from this former region and not from Mesopotamia or Syro-Anatolia.

CONCLUSION: NETWORKS OF TRANSMISSION

The Black Sea is situated at the crossroads of the main axes of interaction across Eurasia. The major route from central and southwest Asia to Europe passes south of the Black Sea through the interior of Anatolia. Along this "royal road" farming technology spread westwards from the Fertile Crescent to the southeast borders of present-day Europe in the course of the eighth and seventh millennia

BC (see most recently Pinhasi et al. 2000; Gkiasta et al. 2003). Another major technology that was transmitted through the Anatolian corridor was apparently the metallurgy of copper. The practice of cold-working native copper began in the ninth millennium BC in an arc extending from southeast Taurus and southwest Zagros and was introduced in Europe by farming colonists in the sixth millennium BC (see Schoop 1995; Leshtakov 2004, 16; Roberts et al. 2009; Borić 2009, 237).[18] Around 5300–5000 BC, the innovation of copper smelting appeared at the same time in southwest Asia, Anatolia and southeast Europe (Roberts et al. 2009; Borić 2009). Several centuries later, by the second quarter of the fifth millennium BC, metal-producing communities in these regions simultaneously began to melt larger amounts of metal and cast heavy copper tools.[19] In the late fifth millennium, the use of arsenical copper started in Iran and eastern Anatolia and spread to the west to reach the southeastern borders of Europe by 4000–3800 BC.[20] The synchronicity of these major innovations in the Middle East and Europe is striking and their timing can hardly be considered coincidental.[21] It seems plausible that "perishable" innovations like woolly sheep and the exploitation of paired draught in farming and transport, for which there is barely any evidence between the Upper Euphrates and the Carpathian basin, also dispersed along the Anatolian corridor. The juxtaposition of metal crafts and the technology of harnessing and animal-drawn transport offers an interesting perspective on the process of diffusion of complex innovations. In both areas of technological endeavours new techniques and ideas dispersed on a nearly global scale at a rate that seems astonishingly fast. The efficiency and reliability with which innovations were conveyed across vast distances pre-supposes established communication networks that were certainly less formal but more enduring than the rigid trade networks envisioned by archaeologists.

The second major route of communication in prehistoric Eurasia, which ran along the grassland belt stretching from Mongolia to the Lower Danube, touched upon the northern fringes of the Black Sea. Broomcorn millet and cannabis, two East Asian plants first cultivated in north China, were transmitted to central Europe through this northern axis in prehistory (see Chapter 6). Moreover, an independent tradition in pottery-making, which emerged among the hunter-gathering communities of southern Siberia, spread to the west along the steppe corridor to reach the westernmost parts of the grasslands in the late sixth millennium BC (see Chapter 3).

It is tempting to read the explicitly "southern" features of the Maikop archaeological assemblage in the north Caucasus as signs of the integration of the two major Eurasian communication axes during the fourth millennium BC. Around 3700 BC, southern-style artefacts at north Mesopotamian sites signaled the emergence of a vast system of trade and exchange (Rothman 2004). Many researchers tend to see the Maikop assemblages in the north Caucasus as an offshoot of this Mesopotamian economic system (e.g. Sherratt 1997a, 461–466; Rezepkin 2004, 2010, 95 f.; Munchaev 2007; Andreeva 1977; Lyonnet 2000). It seems, however, that the imports and influences came to the north Caucasus from the Iranian highland and central Asia, rather than from the "Uruk world" of Syro-Mesopotamia.

This argument is most clearly illustrated by the artefacts made of central Asian semi-precious stones. In the fourth millennium BC, lively long-distance networks connected the separate regions of Turan (Greater Khorasan), Seistan and Baluchistan, as indicated by the dispersal of painted pottery motives; artefacts of copper, silver, gold, turquoise, carnelian, and lapis lazuli; stone weights; cylinder seals; and shell bracelets (see Kircho 2007). The extension of these exchange networks into northwest Iran and the southwest Caspian is recognizable by the spread of high-value decorative stones like turquoise, lapis lazuli and carnelian. In contrast, turquoise is absent at sites of the early fourth millennium in Mesopotamia, while artefacts of lapis lazuli are extremely rare at this early date. None of the stones has been reported from sites in the Anatolian highlands predating the Bronze Age.

Two silver cups from the kurgan of Maikop, whose figural decorations portray several exotic species (lion, cheetah, desert gazelle and Armenian mouflon) of Middle Eastern origin, are another example of central Asian or Iranian imports. Northwest Iran is one of the few geographic areas in which all species depicted on the vessels lived during the fourth millennium BC. Although the animal depictions from Maikop remain unique, they seem to have some distant similarities to objects from a hoard of five gold and seven silver vessels found near Fullol in north Afghanistan. Moreover, textiles and pigments of possible central Asian origin have been identified among the finds at Klady. The copper tool shapes of the Maikop assemblage also do not derive from the copper-working tradition of Greater Mesopotamia and Anatolia; their best parallels are found in central Asia and Iran. Other peculiarities of the metallurgy in the north Caucasus, like the alloys of copper with lead and silver, the arsenical bronzes with high nickel content, the use of silver and gold, and the techniques of lost-wax casting, manufacturing of metal vessels and jewellery, were also part of the technological system of central Asia and Iran during the early fourth millennium BC. While the single lines of evidence seem inconclusive in isolation, the agreement between them is striking.

The presence of Maikop-style ceramics and artefacts of copper, gold and silver in burials on the lower Don shows that the influence of the north Caucasian material culture reached at least the southeast corner of the Sea of Azov. More distant communities in the grasslands, however, were hardly affected by the innovations. Evidence for the spread of manufacturing technologies like the potter's wheel, kiln-fired ceramics, arsenical copper, the casting of heavy copper tools, fine metalwork, and wheeled vehicles is nearly absent. The failed dispersion of these complex innovations was apparently not a consequence of rejection or lack of information, since the inhabitants of the steppe were obviously interested in obtaining or imitating products which their technical level would not have allowed them to make, for example pots and decorative pins. A social explanation for the non-adoption, as the one developed by Henrich (2004), appears plausible in this case. Complex technologies involve higher costs which cannot be covered by single individuals and skills which are harder to acquire and less affected by individual learning. The adoption and sustaining of a complex technology requires a larger pool of social learners and developed networks of knowledge and practice. The necessary density, interconnectedness and frequency of social interaction were possibly absent in the sparsely populated grasslands of the north Black Sea.

The implications of this supposition for the dispersal of innovations to Europe are substantial. The northern route across the grasslands seems to have played an insignificant role, while the "royal road" through Anatolia, terminating in the Carpathian basin, moves to the foreground. This scenario has been favoured by Sherratt (see Sherratt 2006, 351), who envisioned the route across Anatolia to the Danube corridor and the Baden contact-zone, stretching in an arc from southwest Poland through central and southern Germany to the east Alpine foreland, as the main axes of contacts between southwest Asia and temperate Europe in the fourth millennium BC.

Notes

INTRODUCTION

1 The Black Sea region is rich in natural resources such as fertile soils and abundant grazing, salt, fish, hides, timber, gold, silver and copper.
2 Herodotus (IV, 28) describes winters in Scythia as times of "unbearable cold" lasting for eight months, during which even the sea freezes, while Braudel (1966, 110) claims that the Black Sea of the sixteenth century AD was a wild region on the outmost rim of the Mediterranean ("The far-off Black Sea, limit of Mediterranean shipping, was ringed round by wild lands, with a few exceptions, both uncivilized and de-civilized").
3 The archaeology of the Black Sea coast of Turkey, in contrast, developed as part of Near Eastern archaeology; for details see Chapter 7.
4 In contrast to Childe, Sherratt (1997a, 539) describes the essence of urbanization as "the import of raw materials and the export of value-added manufactures".
5 For references see Sillar and Tite (2000). For an attempt to combine concepts of the French and North American schools see the contributions in Stark (1998); for use of the concepts of the French tradition by the British "post-processual" school see e.g. Dobres (2000) and some of the contributions in Dobres and Hoffman (1999).
6 A research team at the Centre National de la Recherche Scientifique (CNRS) was established in the 1970s and continues to publish the journal *Techniques et culture* under the editorship of R. Cresswell. See also Cleuziou et al. (1991, 115–118), according to whom "cultural technology" represents the most important French contribution to contemporaty archaeology and the most promising branch of French archaeological theory.
7 The term was introduced by André Leroi-Gourhan in his lectures in the 1950s (Lemonnier 1992, 25).
8 A view which goes back to the work of Mauss (1936) and his conviction that all bodily actions are in fact techniques.

1. ENVIRONMENT

1 In the prehistoric period, however, deep bays and river estuaries existed in the region of the present-day arid plain around Sivash Lake. Written sources report about freshwater lakes until the second century BC. Later, the estuaries were gradually silted and turned into shallow salt bays. In the seventeenth century, a large marshy area still existed in the region (Shchepinskij and Cherepanova 1969, 16 f.; Shchepinskij 1983 [2002], 6 f.).

2 Today, the natural flora and fauna of the steppe are almost completely destroyed. In Ukraine, 75% of the grasslands have been completely altered after being turned into agricultural land (Ievlev 1991, 21).
3 Herodotus (IV, 53) describes natural saltpans in the estuary of Dnepr. See also Multhauf (1978, 35 f.) with nineteenth-century sources about salt collection in Sivash Lake of the east Crimea. About 55% of the salt produced in Russia in 1832 came from Crimean sources.
4 The present-day mouth of the Danube formed inside a large bay through gradual filling and delta propagation. The landscape in the area of the delta was certainly very different in prehistory. Only during the very active propagation that took place in the nineteenth and the beginning of the twentieth century did the Danube delta acquire its present outlines (see Mikhajlov and Mikhajlova 2008, 112 f., Fig. 3).
5 In geographical terms, the border of the Black Sea region runs along the southern foot of the Pontic mountains (Erol 1983, 103).
6 For a summary about modern coastal topography see Ignatov (2008).
7 Local tectonic activity, alluviation, landslides and erosion destroy or modify the geomorphological evidence. The consequences of neotectonic movements and their interplay with eustatic change are still underestimated; see Orachev (1990).
8 During the course of this transgression the present-day shelf still formed a land mass, including a loess-covered alluvial plain connecting the Crimea with the Dobrudzha, and a plain in the present Azov Sea (see Stanko 1997, Fig. 2).
9 Sapropel is a deep-water sediment consisting mainly of dead plankton organisms. The inflow of saline water creates anoxic conditions in the bottom waters of the Black Sea and leads to massive dying of plankton and the formation of sapropel deposits (see also Atanassova 2005).
10 The level of the lakes fell; some were disconnected from the sea and Lake Durankulak was drained (as demonstrated by a peat layer dating to the early third millennium BC), possibly because of aridization (Filipova-Marinova 2007, 469 f.).
11 Bioproductivity strongly depends on the balance between rivers and sea, which has been significantly disturbed in the last century by human impact, especially industrial and agricultural pollution, river regulation, irrigation, and draining of coastal wetlands.
12 Atlantic mackerel disappeared in the 1970s, possibly as a result of severe pollution in the sea of Marmara. Significant decreases of migrating bonito and tuna have been observed (Finenko 2008, 360–363).
13 Today, the last existing population of beluga migrates upstream in the Danube.

2. A FRAMEWORK OF TECHNOLOGY

1 Definitions in English generally emphasize knowledge, efficiency or working strategy, e.g. "Application of scientific and other knowledge to practical tasks by ordered systems that involve people and organizations, living things and machines" (Pacey 1983, 6) or "A technology is a design for instrumental action that reduces uncertainty in the cause-effect relationships involved in achieving a desired outcome" (Rogers 2003, 13).
2 See Pfaffenberger (1988, 237, with references) for such definitions of technology ("domination over nature"); he discerns the roots of this ideological notion in Christian metaphysics.
3 See also Dobres (2000, 15), who points at the association in Western industrial society of males with hard and valued materials and objects (weaponry, transportation, machines) and females with soft and less-valued, less advanced materials and activities (food, textiles, nursing, sewing, cooking). In addition, occupations

which are mainly practiced by females may be perceived as low-status and less "technical" simply because of the generally lower status of women in society.

4 E.g. Pfaffenberger (1992, 501) emphasizes that "Among the Montagnards of highland Vietnam, agriculture is no mere matter of material culture and manual labor. On the contrary, ritual is a key component of agricultural work; the rites call forth social groups to engage in specific activities, and they provide a metacommentary on the entire productive process." Rituals have, therefore, a crucial role in labour coordination.

5 Dobres (2001, 49) speaks of a "capitalist world view that fetishizes the artifact and the commodity above all else".

6 E.g. hunting or gathering, which involve very complex knowledge and bodily skills but simple tools, are hardly considered in the context of technology (cf. Ridington 1999, 167).

7 For more about the basic differences between human and animal technology (the "second-order instrumental action" and hence the "divorce of making from use") see Aunger (2010).

8 This is also true for technology in day-to-day activities that appear repetitive and mechanical but in fact involve constant variation and creative adjustments (see Keller 2001, 43). See also Ingold (2010).

9 For studies of craft from the perspective of the practitioner see Keller and Keller (1996) and Keller (2001).

10 The most radical proponents of these assumptions advance a deterministic perspective and argue that technology has predictable effects on society (e.g. large-scale irrigation gives rise to the state) – in anthropology such views are found e.g. in the work of Leslie A. White, Karl Wittfogel and Marvin Harris; see Pfaffenberger (1988, 243), and for a critique of stadial models in archaeology in general see Sherratt (1995).

11 Technology was viewed by cultural ecologists as a neutral category constrained only by the laws of nature. Materials studies in archaeology remained largely descriptive and focused on provenance. Research on technology did not attempt the reconstruction and understanding of manufacturing sequences but rather of technology's universal "laws" (such as, e.g., the assumed causative relation between climate and the use of pottery kilns, or the association between pottery shapes and diet). This trend was especially popular in ceramic studies, with researchers meticulously studying "performance" characteristics and strategies for optimizing pottery vessels and reconstructing the ecological and physical constraints of pottery manufacture (Rice 1987; Arnold 1989; Schiffer et al. 1994; Young and Stone 1990). For a critique of the limitations of the "ceramic ecology" approach see Gosselain (1998), who questions the reliance on experimental observations in "artificial" laboratory conditions without a cross-check with archaeological records and observations made in traditional contexts of use.

12 According to White's (1949) definition of culture as humankind's "extrasomatic means of adaptation". More precisely, according to the principles of cultural ecology the relationship between (socially neutral) technology and society is controlled by a feedback mechanism and develops through a sequence of thresholds and stages of homeostasis. The feedback process guarantees that given thresholds will cause particular changes in technology and predictable social changes (see e.g. Renfrew 1986 about the association between metallurgy, wealth, and social differentiation at the Copper Age cemetery of Varna). The division of technology and society strengthened the view that artefacts have two dimensions, one instrumental ("real" and worth studying) and one social (e.g. style and symbolism), the latter being useful but unimportant since they have no "real" function and effect (see Pfaffenberger 1992, 496).

13 Pfaffenberger regards this "standard view" as a commonsense approach to technology that is shaped by everyday understanding and deeply rooted in European Modernism. Moreover, Ingold (1990) argued that separation between society and technology is a modern concept associated with contemporary modes of production by means of machines, devices that are, at least apparently, independent of human agency. (Mechanized production is gradually "disembedding" technical activity from human social relations, as persons become external to production.) Views of progressive and cumulative development arise by reading this modern condition back into history, regarding manual tools as predecessors of mechanized tools. However, as Ingold clearly shows, tools are not predecessors of machines, and technical evolution is in fact not a process of *complexification* but of *objectification* (Ingold 1990, 11).

14 Moreover, objective efficiency is not a guarantee for success; see MacKenzie and Wajcman (2003, 19 f.) with examples of "path dependence", the importance of the particular history of adoption of a technology for its success.

15 See e.g. Pfaffenberger (1992, 500) on the role of the water temple in Balinese irrigation for coordinating rights and responsibilities through rites, offerings and libations (the temples support cooperation and solidarity, without which the system would not work).

16 An intellectual tradition that goes back to the work of Mauss (1936); see Lemonnier (1986, 150, 159 f.; 1993). Lemonnier (1993, 25) describes the interplay between physical constraints and cultural norms as the "translation" of physical laws into cultural categories.

17 Researchers using the *chaine opératoire* approach include, e.g., Gosselain (1998), Roux et al. (1995) and van der Leeuw (1993). For the limitations of the *chaine operatoire* approach see Ingold (2010, 98): every stroke of a carpenter sawing a plank is different even if they appear identical; repetition is not possible, since the process of making something involves multiple variables and thus demands continual correction and adjustment on the part of the artisan (an aspect which remains beyond the reach of *chaine operatoire* recording, which represents such actions as repetitive). See also Keller (2001, 27): "What appears to the observer to be a linear series of steps, a chaine opératoire", Keller argues, "is a complex reciprocal process for the practitioner".

18 See also Leroi-Gourhan (1945, 344–345), who maintains that a "technological milieu" is continuous; new actions have to be related to those already existing and there is a mental template to which they have to link. The notions of "scientific discovery" and "technology as applied science" contain some elements of a myth; see, e.g., MacKenzie and Wajcman (2003, 6 f.) and Pfaffenberger (1992, 513; 1988, 239). The history of science and technology shows that, even in the case of modern technology, invention is generally not based on organized scientific knowledge or produced by applying pre-existing scientific knowledge. Rather, science follows technology, or both spheres are at least mutually dependent. See also Gille (1966), who admits that with the exceedingly complex developments in technology that have taken place since the late nineteenth century, important technical breakthroughs no longer can take place outside science; in the more distant past, however, invention did not feed on scientific knowledge but on long practical experience and mechanical knowledge.

19 A further example is the difference between early Chinese metallurgy, which was based on a pottery paradigm; European and Near Eastern metallurgy, based on a lithic paradigm; and Andean metalwork, based on a textile paradigm (see Epstein 1993, 45, with references).

20 Further examples may be found in Hägerstrand (1988, 221), e.g. the technology of building skyscrapers, which was practicable only after elevators and especially the telephone became available.

21 If the ard were to be introduced in such a context, deep and important changes would be necessary not only in tillage technology but also in the whole technological system of crop cultivation (sowing, weeding, harvesting, etc.).

22 In metallurgy, by extension, smelting and melting are examples of processes based on recipes which are easy to alter, while forging and the "tooling techniques" are dependent on internalized motor-habit patterns.

23 See also Balasse and Tresset (2007, 82): "Animal husbandry is a cultural manipulation of a biological system".

24 This, of course, does not mean to deny the *impact* of farming in terms of economic growth or ecological change.

3. EURASIA: THE NEOLITHIC PROLOGUE

1 For the difference between cultivation and domestication see Weiss et al. (2006, 1608): "Human domestication of plants can be divided into three stages: 'gathering,' in which people gathered annual plants from wild stands; 'cultivation,' in which wild plant genotypes were systematically sown in fields of choice; and 'domestication,' in which mutant plants with desirable characteristics were raised."

2 The cultivation of wild einkorn, emmer, rye and lentil may have been practiced at the PPNA sites Jerf el Ahmar and Dja'de in northern Syria (Weiss and Zohary 2011, 251).

3 For example at the early PPNB sites Cafer Höyük and Çayönü in southeastern Turkey (Weiss and Zohary 2011, 252).

4 Barley at middle PPNB Aswad and Jarmo, and lentil at Yiftah'el (Weiss and Zohary 2011, 251).

5 For example pig at Mezraa-Teleilat, Tell Halula, Sabi Abyad II, and Tell Aswad and cattle at Cafer Höyük, Mureybit, Tell Aswad, Wadi Jilat 7, and Baja (Conolly et al. 2011, 543).

6 At Tell Halula and Tell es-Sinn, and Qdeir 1 in the Euphrates region, Tell Magzaliya in the Zagros, Hayaz Höyük, Mezraa-Teleilat and Gürcütepe II in Southeast Anatolia, and Can Hasan III in central Anatolia (Conolly et al. 2011, 543).

7 The straight shaft is suitable for gathering and holding a bundle of plants with one hand and cutting the stems with the sickle in the other hand; the curved shaft allows both gathering and cutting with the same hand, and is therefore more efficient (Ibáñez et al. 2007, 161).

8 Stone hoes at the mid-PPNB sites Tell Halula and Çayönü and at some sites in the Zagros (Ibáñez et al. 2007, 159).

9 Fot the first use of mudbrick during the PPNA in the southern Levant see Twiss (2007, 27).

10 Circular ovens, comparable to the present-day Anatolian tannurs, were uncovered in a courtyard at Sabi Abyad II (Akkermans and Schwartz 2003, 64). Oval and horseshoe-shaped ovens have been reported from other mid-PPNB sites, e.g. Bouqras (Akkermans et al. 1983, 342 f.) and Jarmo (Braidwood et al. 1983, 157).

11 Fragments of a seed capsule from mid-PPNB Jericho dating to 8250–7500 cal. BC may represent an even earlier occurence of morphologically domestic flax; more precisely dated are the linseed remains from the LPPNB levels at Tell Ramad, c. 7250–7000 cal. BC (Weiss an Zohary 2011, 251).

12 While early cultivation involved the growing of fibre plants, animal breeding initially did not provide raw materials for the textile crafts. Wild sheep and their early domestic descendents had a hairy coat and there is no evidence for the use of wool in the early millennia of farming (see also Chapter 8).

13 This technique was characteristic for eastern Anatolia during the mid-eighth millennium BC, e.g. at Cafer Höyük and Çayönü in the Upper Euphrates Valley, and

Akarçay, Hayaz Höyük, Gritille, and Mezraa-Teleilat in the Middle Euphrates (Borrell 2011, 216).

14 A lime-plastered rounded bench in a small building at Eynan (Bar-Yosef 1998, 163).

15 Two tons of limestone were burned to produce the floor of only one room at Çayönü; about 7 t of lime plaster were produced for the floor of one house at Yifthel (Kingery et al. 1988, 238).

16 Two pieces of metallic copper have been reported from Nemrik 9, a site situated in the western slopes of the Zagros mountains and dating to the beginning of the ninth millennium BC; numerous copper artefacts from the late ninth and early eighth millennium BC were recovered at Çayönü (Schoop 1995, 25 f.). The use of cold-worked copper continued during the eight, seventh and sixth millenniums BC and spread westwards into central and western Anatolia and eastwards into Iran (see also Chapter 8).

17 Copper minerals can begin decompsoing under certain conditions at 400–500°C (as confirmed by experiments carried out by Coghlan; see Schoop 1995, 40, with references). Schoop (1995, 40 f., 51 f.) argued convincingly that the inception of smelting did not require radical conceptual changes. The earliest indisputable evidence for smelting copper minerals provides slags and technical ceramics at late- sixth-millennium sites in the Balkans and in Iran (Roberts et al. 2009, 1014).

18 The earliest evidence is possbly from Tal-i Iblis and Değirmentepe (see Chapter 4 and Schoop 1995, 37).

19 Layers of the Late Neolithic (the period Karanovo IV, dating to the last centuries of the sixth millennium) have been excavated at Tell Burgas, Budzhaka and Akladi Cheiri (Leshtakov and Klasnakov 2008; Klasnakov et al. 2009; Leshtakov 2009; Leshtakov et al. 2009; Klasnakov et al. 2010; Leshtakov and Samichkova 2010; Leshtakov and Klasnakov 2010).

20 Among the earliest sites are Medgidia-Cocoase in Romania, and Durankulak Nivata and Shabla Novite Lozja in Bulgaria (see Dimov 1992; Slavchev 2008, with references).

21 Metallic copper was present in the earliest farming villages in the Balkans – copper beads and awls made of cold-worked native copper were found at sixth-millennium sites in northeast Bulgaria, east Serbia, central Bosnia, the Danube Gorges and Transylvania (see Borić 2009, note 1; Todorova and Vajsov 2001, 8). Pieces of copper ore have been found in situ in a dwelling at Jabalkovo, dating to the Karanovo I period (the first quarter of the sixth millennium BC) (Leshtakov 2004, 16).

22 For radiocarbon dates from cemeteries in the Dnepr rapids see Lillie (1998).

23 The layer without pottery at the site Soroki II on Dnestr provided a ^{14}C date in the second half of the seventh millennium cal. BC (Wechler 2001, 36–39). The faunal assemblages from excavations in the 1960s was re-studied by Benecke. The faunal assemblages from layers without pottery at Soroki contained bones of wild animals (mainly red deer, cattle and pig), but sheep and goats were absent; mesurable indications for domestic species were not provided in either the published data or the re-studied bone assemblages (Wechler 2001, 37 f.). Old studies of animal bones from the three layers without pottery at the site Kamennaja Mogila on Molochnaja identified bones of domestic animals, including sheep; Benecke's re-study, however, identified only wild species, both in the aceramic layers and in the layers with pottery (Wechler 2001, 87).

24 A re-study of the bones from layers at Soroki III containing Criş-type pottery identified only six metrically distinguishable bones of domestic cattle (Wechler 2001, 39–40).

25 Samples from the section at Matveev Kurgan I show the presence of cereal pollen; the artefactual material included blades with "sickle gloss", polished axes and a

few crude ceramic sherds (Wechler 2001, 151). The animal bone assemblages from Matveev kurgan I and II contained single bones of small ruminants, while wild horse and wild donkey predominated (Wechler 2001, 145). A radiocarbon measurement of a charcoal sample from Matveev kurgan I suggests a date around 6000 cal. BC (Le-1217, 7180±78 BP; see Wechler 2001, 131, with references).

26 There are no animal bones from the beginning of the pottery period on Dnepr (early Sursk-Dnepr culture), and later assemblages did not provide indisputable evidence for domestic species (Welcher 2001, 81–83, 90, 223).

27 For the earliest finds of pottery on Bug and Dnepr and on the Azov coast see Wechler 2001, 219, 222, 226, 235.

28 The influence of Cris-type flat-bottomed rounded ceramics (belonging to a pottery tradition of Balkan and ultimately southwest Asian origin) is recognizable only at sites in the valley of Dnestr.

29 See Kuzmin (2002) and Kuzmin and Vetrov (2007) for ^{14}C dates from Ust Karenga. The first measurements were obtained in the mid-1990s. For ^{14}C-dated early pottery in other regions of East Asia see Kuzmin (2006, 2010).

30 The "pointed-bottom" tradition spread in the East European Plain (Narva and Neman cultures) around 5500 cal. BC and reached communities of hunter-gatherers in north Germany and south Scandinavia (Ertebølle culture) and western Europe (Roucadourien, Swifterbant culture, Cardial pottery culture, La Hoguette) around 5300–4600 BC (Klassen 2004, 109–117, Fig. 87). See also Dumpe et al. (2011, 435): "… an ancient and widespread craft tradition, which could have its latest offshoot in Inuit pottery in Northwest Canada".

31 For example, a re-study of the bone assemblages from Soroki I and V on Dnestr did not show the presence of domesticates (with the exception of one sheep tooth from Soroki I) (Wechler 2001, 42 f.). Sites on Dnepr (e.g, Igren VIII) also yielded only bones of wild species (Wechler 2001, 83). Kamennaja mogila provided two bones of domestic cattle while sheep were identified at Rakushechnyj Jar (Wechler 2001, 147). Imprints of domestic cereals on pottery sherds were attested to in small numbers at several sites (Wechler 2001, 90 f.).

32 At sites on Dnepr (Buzki, Igren V, Sobachki) the proportion of domestic cattle, sheep and pigs reached 30% (Wechler 2001, 84, 86).

33 Comparable archaeological and bioarchaeological materials have been recovered at the Chokh site in Dagestan (Kushnareva 1997, Wechler 2001, 201).

34 Details and references on fifth-millennium metallurgy of copper and gold in the Balkans and eastern Carpathians are provided in Chapter 6.

35 For fifth-millennium sites in the Ukraine see Rassamakin (1999), and for a summary on the North Caucasus in the fifth millennium see Ivanova (2008b, with references).

4. THE VALLEY OF THE LOWER KUBAN

1 Veselovskij excavated prehistoric graves at Psebajskaja (1895), Kostromskaja and Tsarskaja (1897), Maikop (1898) and Belorechenskaja (1907) in the Caucasus piedmont and Zisserman on the lower Kuban (1900). The discovery of the unique kurgan in the town of Maikop appears less surprising if one considers the total number of kurgans (more than 500 in c. 20 years, about 130 of them only between 1901 and 1903; see Tikhonov 2009) excavated by Veselovskij in the Kuban region.

2 The term "Maikop" is used here as synonymous for "North Caucasian Early Bronze Age" and as a general substitute for numerous other names present in the literature, including the term "Maikop-Novosvobodnaja community" (Майкопско-новосвободненская общност, МНО), favoured in the Russian-language literature.

3 Safronov's excavations remained unpublished but some of his finds were briefly mentioned in an article by Trifonov (1991).

4 The Kubanskaja expedition of the Institute of Material Culture in Saint Petersburg in 1980 at Baturinskaja (Sharafutdinova 1980); the Severo-Kavkazkaja expedition of the Institute of Archaeology in Moscow in 1987 at Olenij 1. The Abinskij section of the Severo-Kavkazkaja expedition excavated in 1984 at Jastrebovskij, in 1986–1987 at Obshtestvennoe 2 and in 1987 at Bugundyr VI (Gej 2008); the Adygea Institute worked in 1981–1983 at Psekup (Lovpache 1985; Lovpache and Ditler 1988); the Adygejskaja expedition excavated in 1981–1984 at Krasnogvardejskoe (Nekhaev 1986) and the Museum of Krasnodar in 1985 at Novokorsunskaja (Kondrashov and Rezepkin 1988, Rezepkin 2000, 74); Kavkazkaja expedition of the State Museum for Oriental Art (GMINV) in Moscow worked in 1981–1984 at Uljap and Chernyshev II (Bianki and Dneprovskij 1988), in 1987–1988 at the settlement Sereginskoe (Dneprovskij 1991), and in 1988 at Uashkhitu I (Korenevskij and Dneprovskij 2003).

5 The list of published sites includes the coastal area graves at Psyb (Teshev 1986), Rassvet (Munchaev 1975, 263–267), Raevskaja (Munchaev 1975: 261 f.), Natukhaevskaja (Shishlov and Fedorenko 2006; Shishlov et al. 2009), Sennaja (Sokolskij 1965, 115), Kuchuguryj (Kublanov 1959), Temrjuk (same as khutor Korzhevskij, see Trifonov 1991), Jastrebovskij (Gej 2008), and Obshtestvennoe II (Sorokina and Orlovskaja 1993); in the Azov steppe graves at Olenij I (Gej 2008), Dneprovskaja (see Trifonov 1991), Baturinskaja (Sharafutdinova 1980), Timashevsk (see Trifonov 1991), and a hoard from Staromyshastovskaja (Veselovskij 1900b); on the Lower Kuban graves and habitation sites at Krasnogvardejskoe (Nekhaev 1986), Taujkhabl (Rezepkin 2000), Chishkho, Gorodskoj and Pshikujkhabl (Rezepkin and Lyonnet 2007), Novokorsunskaja (Rezepkin 2000, 74), Psekup (Lovpache 1985, Lovpache and Ditler 1988), and Pkhagugape (Rezepkin and Poplevko 2006); south of Kuban sites at Chernyshev II (Bianki and Dneprovskij 1988), Tenginskaja (unpublished, see Korenevskij 2008b, 11), Uljap (Eskina 1996; Brileva and Erlikh 2011), Sereginskoe (Dneprovskij 1991), Uashkhitu I (Korenevskij and Dneprovskij 2003; Erlikh et al. 2006) and Vozdvizhenskaja (Veselovskij 1902).

6 Named by him "Early Kuban Group", the term "Maikop culture" was introduced by Krupnov in 1951.

7 On these grounds ("developmental closeness" considered as evidence for synchronism) Iessen dated the early (Maikop) material to 2300–1900 BC, and the late (Novosvobodnaja) material to 2100–1700 BC.

8 Maikop pottery also was recovered at the settlement site Konstantinovsk, and in graves at Konstantinovsk VIII 3/9 (together with silver jewelry) and Mukhin II 5/16 on the lower Don (Kijashko 1994); it was also documented in the Kuma-Manych lowland (Shishlina 2007, Fig. 18, 3) (for the chronology of these graves see Rassamakin 2004a, 162 f., Fig. 121). Further to the west, possible Caucasian imports of carinated jars with a low neck, even orange surface, and pattern polished or incised decoration on the shoulders have been reported from Sokolovo I 6/4, Zhivotilovka, and Pavlograd I 8/3 in the valley of Samara (Rassamakin 2004a, 127 f., Fig. 102, 9–12). Rassamakin's group IIIC, to which the latter graves belong, can be correlated with Tripolie C2 through painted pottery imports (Rassamakin 2004a, 126).

9 According to Korenevskij and Rezepkin (2008, 114) about 69 dates are available at present. Moreover, a charcoal sample (IGAN-723) from Level 7 at Razdorskoe on the lower Don, which yielded typical Maikop pottery, also points to the second half of the fourth millennium BC (Kremenetski 1997, 40).

10 From Dneprovskaja 1 2/5–8–12 (OxA-4707, human bone; Korenevskij 2004, Table 11; Trifonov 2004), Baturinskaja (OxA-4709, Zaitseva and van Geel 2007),

and Sereginskoe (Ki-14226, pottery; Korenevskij and Rezepkin 2008). Moreover, Brileva and Erlikh (2011) report about radiocarbon measurements on samples of animal bones from the settlement at Uljap. The four samples originate from two pits and two concentrations of pottery and bones, and have calibrated ranges between 3900 and 2900 BC.

11 All sites are situated south of Kuban: Uljap (Brileva and Erlikh 2011), Sereginskoe (Dneprovskij 1991), the sites on the shore of Krasnodar reservoir Chishkho, Pkhagugape, Gorodskoj, Pshikujkhabl, and Psekup (Lovpache and Ditler 1988; Rezepkin and Lyonnet 2007), and the site at Uashkhitu (Korenevskij and Dneprovskij 2003).

12 At Uljap patches of two clay house floors and several pits were recovered under a Meotian kurgan (Brileva and Erlikh 2011).

13 At Psekup were investigated hearths, rubbish pits, large pithoi associated with other vessels and numerous fragments of granite saddle querns, but no architecture was recognized. Concentrations of complete vessels at this site (Lovpache and Ditler 1988, 105) may indicate unrecognized pit hearths with crushed vessels.

14 A pithos with a rim diameter of 36 cm was found at Sereginskoe and fragments of a large pithos came to light at Uljap (Dneprovskij and Korenevskij 1996, 6; Brileva and Erlikh 2011).

15 Similar architectural remains were uncovered at sites in the Caucasus foreland, for example structures with wattle-and-daub walls, floors of beaten clay and sunken hearths at Novosvobodnenskoe (Rezepkin 2008), Ust Dzheguta (Nechitajlo 2006a) and Galjugaj 1 (Korenevskij 1995). Galjugaj 1 consisted of a group of loosely spaced dwellings, situated 12–20 m from each other (Korenevskij 1995, 79).

16 Examples of collective burials include Psyb (seven skeletons in a stone cist; Teshev 1986), and Vozdvizhenskaja (four skeletons in a crouched position covered with ochre and accompanied by several large copper objects; Veselovskij 1902, 47).

17 E.g. at Olenij 1/11, 2/30 and 2/34 (Gej 2008, 183) and at Novokorsunskaja (Kondrashev and Rezepkin 1988).

18 The former features have been encountered only in graves situated south of Kuban, e.g. at Chernyshev II 10/2, 1/4 (Bianki and Dneprovskij 1988), Uljap 17/7 (Bianki and Dneprovskij 1988, 75f.) and Vozdvizhenskaja (Veselovskij 1902, Pl. 2). A tomb with crude stone walls constructed on the ground surface has been reported from Rassvet 3/1 (see Korenevskij 2008b, 11, Fig. 15, 1). Walls of stone boulders, timber frames and pebble flooring also have been encountered at cemeteries in the piedmont, e.g. at Klady11C/9 (Rezepkin 2000, 42 f., Pl. 7, 1), Mostovskaja (Korenevskij 2008b, 10 f., Fig. 14, 1), Kurgan 3 at Bamut (Munchaev 1994, Pl. 44, 8), Kishpek 1/2 (Chechenov 1984, 173 f., Fig. 12), and Kishpek 2/3 (Chechenov 1984, 181, Fig. 16).

19 A possible exception represents the stone tomb at Psyb (Teshev 1986). For timber- and stone-built tombs and stone-framed graves in the central Caucasus (at Kishpek, Chegem, Nalchik) see e.g. Betrozov and Nagoev (1984) and Chechenov 1970, 1984). “Dolmens” were excavated at Klady (Rezepkin 2000; Veselovskij 1901) and Kostromskaja (Dneprovskij et al. 1995).

20 Deviations from this position are rare, e.g. Grave 15 at Timashevsk with a skeleton lying on its back with contracted legs (Kaminskij 1993).

21 Mats were recovered at Jastrebovskij and Olenij (Gej 2008), and a heap of stones was observed at Fontan (Munchaev 1975, 267) and Jastrebovskij (Gej 2008).

22 At Jastrebovskij (Gej 2008, 179 f.), Obshtestvennoe II and Uashkhitu 1 (Korenevskij and Dneprovskij 2003, 90 f). For comparisons in the central Caucasus, e.g. at Kudakhurt, see Korenevskij et al. (2008, 127).

23 There are possibly graves without tumulus, e.g. at Uashkhitu 1 (Korenevskij and Dneprovskij 2003).

24 The kurgan at Jastrebovskij with its height of 2.3 m (Gej 2008, 179) belongs to the mid-sized tumuli. Very large kurgans like Inozemtsevo (7 m high; Korenevskij and Petrenko 1982), Kurgan 1 at Zamankul (6 m high; Korenevskij and Rostunov 2004, 154), Nalchik and Maikop (the latter was 11 m high and about 100 m in diameter; Korenevskij 2005b) were very rare.

25 Evidence for enlargements without new burials is also available from the central Caucasus. The large kurgans at Brut and Zamankul had between two and five layers, and their huge stone revetments were constructed only after the last enlargement (see Korenevskij and Rostunov 2004; Korenevskij 2005b). At Kudakhurt, Korenevskij et al. (2008) observed several episodes of construction including layers, pits, stone revetments, etc.

26 Larger cemeteries were excavated in the foothill area, e.g. about 30 kurgans at Novosvobodnaja/Klady (Rezepkin 2000) and 17 at Ust Dzheguta (Munchaev 1975, 228–241).

27 Re-opened, emptied and damaged graves are very common. In some cases the graves were apparently opened during the Maikop period, e.g. Kurgan 3 at Brut (see Korenevskij and Rostunov 2004, 153).

28 For further rich graves in the piedmont area of the west and central Caucasus (Chegem I 5/3, Kishpek II 1/1, Inozemtsevo, Kudakhurt, Klady 30/1) see Betrozov and Nagoev (1984), Korenevskij (1981), Chechenov (1974), Korenevskij and Petrenko (1982), Korenevskij et al. (2008), and Rezepkin (2000).

29 According to the description of Veselovskij in his original field report (Veselovskij 1897 [1997]); the report includes a very crude drawing. This skeletal position is unusual, but cf. Sherratt (1997a, 387) with an interesting suggestion: the reason for a supine position might be, in his opinion, the display of fine clothing and ornaments during the funeral.

30 According to the chemical analysis it was minium (lead tetroxide, Pb_3O_4) (Veselovskij 1897 [1997]). Minium is a rare mineral which forms in lead ore deposits and can be artificially produced by heating lead ores (e.g. from lead carbonate [cerrusite or "white lead" $PbCO_3$] and from lead oxide or "yellow lead" PbO) to 480°C in oxidizing conditions. It is very toxic if inhaled, ingested, or absorbed through the skin.

31 For a comprehensive summary about metal vessels see Korenevskij (1988, Figs. 4 and 6).

32 In all of the chambers a total of 5.500 beads were recovered, including more than 40 turquoise beads and more than 780 carnelian beads (see Piotrovskij 1998, 244 f.).

33 Cauldrons and bowls, flat and shaft-hole axes, daggers, chisels, an awl and a sword of copper, a stone hammer axe, a flint dagger, stone tools (whetstones, grinding palettes), flint arrowheads, hundreds of beads and rings of carnelian, rock crystal, gold and silver, two copper dog figurines, silver pins, two copper "forks", a clay vessel.

34 Graves with several skeletons were uncovered e.g. at Klady 31/5 (child and adult, not sexed; Rezepkin 2000), Maikop (three adults), Nalchik (two adults), Zamankul (an adult female together with a male; Korenevskij and Rostunov 2004). For individual graves see Klady 28/1 (a 22–25-year-old male), and Klady 30/1 (a 30-year-old female) (Rezepkin 2000).

35 Horse bones were found at Pkhagugape (Spasovskij 2008). In Galjugaj, bones of horse and two different species of donkey, "kulan" and "ass", were identified (Korenevskij 2004, Table 15). Kulan, *E. hemionus* or Asiatic wild ass (also called onager) inhabited a vast area from the north Caucasus to the Dnepr (see Clutton-Brock 1992, Fig. 2.9, for the probable former distribution of *E. hemionus*) and has never been domesticated (see Clutton-Brock 1992, 37). Concerning the second equid (the "ass"), there are two possibilities. If it is indeed *E. asinus* (domestic ass), it must have been an introduction from southwest Asia (for evidence of the

domestic donkey in southwest Asia around 3200 BC from Uruk-Warka, Arslantepe, and Hassek Höyük, see Boessneck et al. 1984, Bökönyi 1983, 589; Boessneck and von den Driesch 1992, 68). However, it appears more plausible that this animal was in fact *Equus hydruntinus*, the European wild ass, a now extinct species which inhabited the north Black Sea region in the early and mid-Holocene, see e.g. Spassov and Iliev (2002, 317). For identification of *Equus hydruntinus* at the late-fourth-millennium site of Majaki, see Chapter 6.

36 Plant remains in a vessel from Nezhinskaja 5/13 were identified as *Lithospermum officinale* L., common gromwell (Korenevskij 2003, 283), a wild plant with pharmacological properties. Kurgan 3 at Baturinskaja provided a bone harpoon (Sharafutdinova 1980, 19; Trifonov 1991, Fig. 6, 31).

37 The pithos from Sereginskoe had a rim diameter of 35 cm, while the rim diameters of the huge pithoi from Bolsheteginskoe reached 60–120 cm.

38 Comparable storage pits were observed at the settlement Dolinskoe in the central Caucasus (Kruglov and Podgaetskij 1941, 157).

39 Saddle querns were also common in other regions of the north Caucasus, e.g. at Galjugaj 1 (Korenevskij 1993a, 1995) and Ust Dzheguta (Nechitajlo 2006a, 67).

40 Circular fire pits situated in the central part of the dwellings were common at habitation sites in the central Caucasus, e.g. at Lugovoe, Dolinskoe, and Galjugaj 1 (Munchaev 1961, 42 f.; Magomedov 2007, 157; Korenevskij 2004, Fig. 11, 5).

41 See Lyons and D'Andrea (2003, 524): "Tannur use was ubiquitous by the fourth millennium B.C.E. and ethnographically was intended for flatbread baking from diploid and tetraploid wheats, barley, millet, and sorghum flours that make dough but have inferior leavening capabilities".

42 Similar clay objects also have been recovered at numerous sites in other parts of the north Caucasus, e.g. inside houses at the site Galjugaj 1 in the Terek valley, and at Lugovoe and Bolsheteginskoe (Korenevskij 1995, 55–58). At Alikonovskoe clay cones were found in a pit together with charcoal (Korenevskij 1998, 105). Many of these artefacts weighed more than 1 kg (for Galjugaj see Korenevskij 1995, 55 and 57). Moreover, they are apparently often found in pairs (see e.g. Korenevskij 1995, 55 f.). Comparable conical clay objects with openings have been found at Late Uruk sites in north Syria, e.g. at Tell Hazna I (Munchaev and Merpert 1994, Fig. 29, 9) and Habuba Kabira (Strommenger 1980, Fig. 37).

43 For the domestication of cotton (*G. arboreum*) in the Old World see Moulherat et al. (2002). At Mehrgarh, a string of cotton fibres was conserved inside a copper bead from a grave dating to the seventh millennium BC; the next earliest remains of cotton fibres were found inside a carnelian bead from a fourth-millennium grave at Shahi Tump in the Makran region of southern Baluchistan (Moulherat et al. 2002, 1439). Cotton fibres and impressions of a cotton fabric also have been identified at Dhuweila in eastern Jordan (Betts et al. 1994), a site dating to the fourth millennium BC. However, according to Moulherat et al. (2002, 1439), cotton at Dhuweila was most likely not locally grown but imported from another ecological zone.

44 At Tepe Sarab near Kermanshah in the Zagros Mountains, the goat-to-sheep ratio changed abruptly in favour of sheep in the first half of the fourth millennium BC, while the kill-off pattern of sheep showed that more animals were allowed to reach maturity in comparison to earlier periods (McCorriston 1997, 521). Payne (1988, 105) observed changes in herding strategies in the lowlands of southern Mesopotamia during the late fourth millennium BC; at Arslantepe on the Upper Euphrates, Bökönyi (1983, 592 f.) recognized a sudden increase in the numbers of sheep from layers VII to VIA around the middle of the fourth millennium.

45 At Hassek Höyük e.g. male sheep predominated over females and sheep were significantly larger than the usual "neolithic" race of this region, resembling more the robust sheep of the Hittite period (Boessneck and von den Driesch 1992, 67).

46 Finds of cone loom weights for the warp-weighted loom are typical for all parts of Anatolia (for example, finds in Arslantepe; Frangipane et al. 2009, 12–15, Fig. 9; see also Chapter 7). The area of distribution of conical loom weights extends westwards into the Balkans and the region east of the Carpathians (for Tripolie see Videiko and Burdo 2004b, 532; Kosakivskij 2003).

47 See Formozov and Chernykh (1964, 104), who mention that obsidian at Palaeolithic and Neolithic sites in the north Caucasus (e.g. at Nizhnaja Shilovka) originates from the Baksan sources in Kabardino-Balkaria, while the obsidian at fifth-millennium sites such as Meshoko and Skala is of south Caucasian origin.

48 Similar arrowheads were found, e.g. in the settlements at Gorodskoj (Rezepkin and Lyonnet 2007, Fig. 8, 2) and Psekup (Lovpache and Ditler 1988, Pl. XX, 7.8). Sets of arrows were recovered from graves in other parts of the north Caucasus, e.g. at Tsarskaja/Novosvobodnaja (7 arrowheads; Veselovskij 1901), Klady 4/1 (12 arrowheads; Rezepkin 2000, 52, Pl. 24, 2) and Inozemtsevo (9 arrowheads; Korenevskij and Petrenko 1982).

49 “Sling-stones” (most probably balance weights; see Bobokhyan 2010) made of rare decorative rocks have been found only at Tsarskaja in the piedmont area (see Popova 1963, 40).

50 These stone artefacts have a length of 20–25 cm. Finds from the region of the lower Kuban include Timashevskaja (Trifonov 1991, Fig. 6, 33) and Tenginskaja 1/6 (Korenevskij 2008b, Fig. 17, 2). For comparisons in other parts of the north Caucasus (Sunzha 3/1, 14/1, 21/5, Ust Dzheguta 13/1, Maikop, and Mostovskaja 3/1) see Korenevskij (2008b, 14 f.). Korenevskij’s association of these north Caucasian artefacts with the animal head scepters of the south Caucasus and west Iran seems convincing.

51 One of the small lapis pendants attached to gold earrings from Kurgan 1 at Tsarskaja broke during perforation and was repaired (set in a gold cap). This repair might be an indication that perforation took place in an area where even such small pieces were very costly and worth repairing, possibly at Tsarskaja itself and for this specific pair of earrings.

52 Tool marks on rock crystal seals from the Jemdet Nasr period showed that similar engravings were made by a technique of micro-flaking involving the use of a sharply pointed tool, and not by wheel-cutting (Sax and Meeks 1994).

53 Crushed shells also were used by potters in the central Caucasus, e.g. at Dolinskoe (Popova 1963, 23).

54 A ceramic ware with coarse mineral admixtures from the settlement of Ust Dzheguta was shaped by coiling (see Nechitajlo 2006b, 144).

55 Fragments of two potter’s wheels were reported from pottery workshops at Ghabristan II dating to the first quarter of the fourth millennium BC (Majidzadeh 1989, Pl. 33).

56 On the Upper Euphrates, mass-produced open bowls appeared in the second quarter of the fourth millennium BC (the Middle Uruk period), e.g. at Arslantepe VII (Trufelli 1997, 16).

57 Principally, round-base vessels can be thrown on the wheel if the lower part is left thicker and shaped by scraping afterwards (Hodges 1964, 29; for further examples see Mahias 1993, 164). An indirect argument for the use of a two-step sequence in the manufacturing of the north Caucasian vessels, however, provides the mode of production of a copper vessel in two separately shaped parts (neck and body) described by Ryndina (2005, 129). It seems possible that this concept was transferred to metal vessels from pottery-making. See also Kantorovic and Maslov (2008, 160) about jars from a grave at Marinskaja in the region of Stavropol, whose necks were produced separately and added to the body.

58 In the central Caucasus at Kudakhurt, see Korenevskij et al. (2008a, 137).

59 For a similar sequence in Pakistan see Rye (1981, Fig. 12).

60 See http://www.asia.si.edu/exhibitions/current/takingshapevideo/takingshapevideo.htm.
61 For example in Papua New Guinea (May and Tuckson 2002), Pakistan (Dels and Kenoyer 1991, 66, with references), or Thailand and the Philippines (Longacre et al. 2000).
62 For other, more unusual methods of shaping vessels with round bottoms, see Mahias (1993, 164).
63 Cf. the pottery at fourth-millennium BC sites on the Upper Euphrates; at Arslantepe VII, dating to the second quarter of the fourth millennium, the wheel was used only for shaping the rim and neck of the (medium and large) jars. Only in the late fourth millennium, in Layer VIA, did mass-produced wheel-made conical bowls appear (Trufelli 1994, 252). See also Hacınebi (Laneri and di Pilato 2000). In the north Caucasus, flat-bottomed jars and bowls were also manufactured on the wheel (impressions on the bottoms of vessels from Lugovoe, Bamut, Klady 31/5; Bobrinskij and Munchaev 1966, Fig. 2; Korenevskij 2008a, Pl. B, 2). However, these ceramics possibly belong to the end of the Maikop period. Comparable are the imprints on the bottoms of vessels of the Velikent II type. The latter show that wheel-shaped pottery was manufactured in Dagestan and northeast Azerbaijan during the late fourth millennium BC, along with traditional hand-made early Kura-Arax pottery (Magomedov 2007, 52).
64 The technique resembles the "reserved-slip" of late Uruk pottery, although the Uruk vessels were not polished. Experiments with reserved-slip ("Auswischtechnik") at Hassek Höyük showed that the best results are achieved when strips of the wet slip are wiped off with a reed leaf while turning the vessel on the potter's wheel (Hermans 1992, 107).
65 See Gibson and Woods (1997, 251): "a technique used to deposit carbon on the surface of a vessel in order to turn it black." Compare Miller (1985, 231).
66 Natukhaevskaja 1 and 3, Pkhagugape, Taujkhabl and Chishkho, Timashevsk, Krasnogvardejskoe, Uashkhitu and Sereginskoe (Kaminskij 1993; Rezepkin and Poplevko 2006, 114; Rezepkin 2004b, 429; Rezepkin 2004a, 99; Nekhaev 1986; Dneprovskij 1991; Korenevskij and Dneprovskij 2003; Shishlov and Fedorenko 2006, 207; Shishlov et al. 2009).
67 One of the earliest of such installations was recovered at the Hassuna period site of Yarim Tepe I, Level X, in northern Mesopotamia (see Hansen Streily 2000).
68 A kiln dating to c. 3300 BC was excavated on the South Hill of Tepe Hissar (Pigott et al. 1982, 217).
69 See Korenevskij (1999, 6) for potter's marks on the bottoms of vessels of the Dolinskoe group.
70 This type of pottery was very common in north Mesopotamia and east Anatolia during the Middle Uruk period, e.g. at Tell Brak, Tepe Gawra XI, and Arslantepe VII (see Trufelli 1994). In Syro-Anatolia and the Caucasus, potter's marks nearly disappeared during the late fourth millennium (e.g. at Arslantepe VIA, sites of the Kura-Arax period in the south Caucasus, and the Psekup group in the western part of the north Caucasus) (Trufelli 1994; Korenevskij 1999, 10 f.).
71 The Moche pottery of coastal Peru offers an archaeological comparison. About 10% of the plain pots had marks on the neck. Through the ethnographic analogy of modern ceramic production in the central sierra of Peru, Donnan (1971) interpreted the marks as signs serving to identify the products of each potter and to prevent confusing prior to marketing, when potters share the same working area and store and fire their pots together.
72 Oates and Oates (1993, 172 f.) observed that in layers of the mid-Uruk period in Area TW at Tell Brak similar vessels have similar marks. The marked vessels were predominantly large jars and casseroles. The excavators suggest that "presumably such symbols indicate either quantity or commodity, or both – perhaps even 'institution' – or some combination of these".

73 An underfired variety of fine ware with fire clouds and grey colour is documented e.g. at Obshtestvennoe II (Sorokina and Orlovskaja 1993) and Chernyshev II 1/1 (Bianki and Dneprovskij 1988, 75).

74 Vessels with rounded bases are suitable as water containers, since they have the maximum of exposed surface and thus keep the liquid cool (Mahias 1993, 166).

75 Pkhagugape and Chishkho, Timashevsk, Taujkhabl, Sereginskoe, Krasnogvardejskoe, and the kurgans at Natukhaevskaja 1 and 3 (Rezepkin and Poplevko 2006, 114; Rezepkin 2004b, 429; Rezepkin 2004a, 99; Kaminskij 1993, 17; Dneprovskij and Korenevskij 1996, 6; Nekhaev 1986, 246; Shishlov and Fedorenko 2006, 207; Shishlov et al. 2009).

76 Uljap 10/2, three cylindrical beads of "paste" (Bianki and Dneprovskij 1988); Uljap Grave 5, beads of paste (Eskina 1996); Obshtestvenoe II 1/1/9, two white paste beads (Sorokina and Orlovskaja 1993, 232). Beads of paste have also been reported from sites in the piedmont area of the west and central Caucasus, e.g. some 500 beads at Kostromskaja (Veselovskij 1900c; Popova 1963, Pl. XXIII), 50 cylindrical beads of white paste and 7 cylindrical beads of black paste at Klady 11/9 (Rezepkin 2000, 43) and some 20 silver beads with paste core at Klady 31/5 (Rezepkin 2000, 63); some 400 paste beads from a grave in Kurgan 6 at Novyj Arshti (Bamut) (Munchaev 1961, 140, Fig. 49); 7 beads from Chegem II 21/5 (Betrozov and Nagoev 1984, 49); and several small white paste beads at Inozemtsevo (Korenevskij 2004, 47, Fig. 88, 13; Korenevskij and Petrenko 1982, 106).

77 However, the examination of supposed faience beads from the steppe northeast of Stavropol (Mandzhikiny 1, 15/4, Zunda-Tolga 1 2/2 and Sharakhalsun 6 5/7) proved that the beads were actually made of clay and stone (Shortland et al. 2007).

78 At Gawra XIX-XVI, beads of white paste were very common (Tobler 1950, 192).

79 For example, inlay plaques and a porcupine figurine from Proto-Elamite Susa (Le Brun 1971, Fig. 70, 23; Le Brun 1978, Fig. 41, 17 and Pl. 21, 2); amulets and stamp seals in animal shapes, minute faience disc beads, double-conoid fluted and cylindrical beads, and rosette beads were found in structures under the "Eye Temple" at Tell Brak (Mallowan 1947, 159, Pl. XVI, XVII, XXVII). Small faience vessels dating to the end of the fourth millennium BC have been recovered at sites in south Mesopotamia (Ur, Khafajah) and Syria (Jebel Aruda) (Moorey 1994, 173; van Driel and van Driel-Murray 1983, 7). The previously mentioned porcupine figurine from Susa 17B is nearly identical to a find from store-room A 340 at Arslantepe VIA in the plain of Malatya (Frangipane 1997, Fig. 19). Small faience beads with light bluish green colour have been found in the Chalcolithic layer of Alişar in central Anatolia (von der Osten 1937, 100, Fig. 101). One bead from Tell Brak has been subjected to spectrographic examination; see Stone and Thomas (1956, 42).

80 See http://aragats.net/field-projects/gegharot-fortress: "79 cylindrical and discoidal beads made of white paste". Moreover, graves at the Kura-Arax site of Amiranis Gora contained "glass beads" and beads of "glass-like paste" (Miron and Orthmann 1995, 67).

81 Situated c. 100 km as the crow flies from the lower Kuban.

82 In the central part of the Greater Caucasus, e.g. in the valleys of the Malka, Baksan and Chegem Rivers.

83 Copper with nickel admixture was also in use in Mesopotamia. Recent research seems to support the hypothesis of the Anatolian origin of copper in Mesopotamia during the Uruk period (Begemann and Schmitt-Strecker 2009, 21–23): the lead isotope composition of Mesopotamian copper objects dating to the fourth millennium BC points to copper deposits in central and northeast Anatolia. See also Tedesco (2007, 319, note 5) and Palmieri et al. (1993) about copper ores in eastern Anatolia.

84 Furthermore, numerous pieces of malachite and small copper objects were recovered at Yarim Tepe I and II, a site in the Sinjar plain of north Iraq dating to the Hassuna and Halaf periods (^{14}C measurements date the site to the early sixth millennium BC) (Merpert and Munchaev 1977). Some of the copper artefacts had levels of iron of up to 10% (see Schoop 1995, 22).

85 Somewhat later is a metallurgical workshop at Ghabristan II, which provided fragments of a heavily slagged crucible and about 20 kg of malachite in nut-sized pieces placed in a large bowl (Majidzadeh 1979). Close similarities of the pottery from Ghabristan II with Sialk III 4–5 and Hissar IB (see Matthews and Fazeli 2004, 64; Helwing 2005, 42, 47) date the former site to the early part of fourth millennium BC. A slag cake from Arslantepe VII with metal prills containing arsenic, lead, nickel and antimony dates to the second quarter of the fourth millennium BC (Yener 2000, 57).

86 See Hauptmann (2000, 142). Such operations were apparently usual for the smelting technology of the late fifth and the fourth millenniums BC, at least in the Levant. At the settlement of Wadi Fidan 4 (Feinan, Jordan), fragments of slagged crucibles, metal prills, and quantities of reworked and crushed slag were radiocarbon-dated to 3500–3100 BC (Hauptmann 2007, 136–140).

87 The earliest silver artefacts in the Old World are probably two beads of native silver from Domuztepe in southeast Turkey, a Halaf-period site dating to the middle of the sixth millennium BC (Carter et al. 2003). Silver objects and litharge became widespread in central and southwest Asia during the first half of the fourth millennium BC. For central Asia see Kara-depe 3 (silver beads of the Namazga II period, second quarter-middle fourth millennium) (Masson and Merpert 1982, 28), Ingynli-depe (finds of litharge, first half of the fourth millennium) (Thornton 2009, 49 f.), Sarazm I-II (22 silver beads from Grave 1, a small silver cup from Grave 4, 24 silver beads from Grave 5, middle-second half of the fourth millennium) (Isakov 1996, 5 f.). For Iran see Tepe Sialk III (two silver buttons and litharge, early-middle fourth millennium BC) (Ghirshman 1938, 54, Pl. LXXXV, 1740; Pernicka et al. 1998, 123; Pernicka 2004a), Arisman (litharge from the mid-fourth millennium) (Pernicka 2004b) and Susa II (silver objects, second half of the fourth millennium; Tallon 1978, 263, No. 1159–1160). For north Mesopotamia see Tell Brak (silver beads from a cache, mid-fourth millennium BC) (Emberling and McDonald 2002); for south Mesopotamia see Uruk-Warka (van Ess and Pedde 1992). For Anatolia see Fatmalı Kalecik (litharge from the beginning of the fourth millennium BC) (Hess et al. 1998), Hacınebi Phase A (two silver earrings from an infant burial in a jar, early fourth millennium) (Stein et al. 1996, 96), Korucutepe B (numerous silver artefacts in graves dating probably around 3000 BC) (van Loon 1978, 11, Brandt 1978). For the South Caucasus see Soyuq Bulaq (beads, second quarter of the fourth millennium) (Akhundov and Makhmudova 2008, 64, 67 f.), Kvatskhelebi (silver spirals from Graves 2 and 7, late fourth millennium) (Glonti et al. 2008, 157, 160). Levantine and Egyptian finds are late, e.g. those from the cemetery of Byblos and graves of the Naqada-period dating to the second half of the fourth millennium BC (Prag 1978).

88 A rare exception is the copper hammer-axe from Klady 31/5 that contains 30% lead (Galibin 1991, 61).

89 Cupellation began during the early fourth millennium BC. The earliest evidence for litharge has been recovered from Fatmalı Kaleçik in strata of the late Ubaid/early Uruk period (Hess et al. 1998). Roughly contemporary are finds of litharge at Ingynli-depe (see Thornton 2009, 49 f.: “finds of slag, prills, moulds, and litharge suggest relatively large-scale production of copper-base alloys, lead, and silver and the manufacture of cast items such as large shafthole axes”). Finds of litharge and possible cupellation hearths dating to the later fourth millennium have been reported from Arisman, Areas C and D (contemporary with the Sialk

IV period; Steiniger 2011, 89 f.) and late chalcolithic Arslantepe (Hess et al. 1998, 65). Finds of litharge from the late Uruk site Habuba Kabira South provide the earliest evidence for the practice of cupellation in north Mesopotamia (Pernicka et al. 1998).

90 Galibin (1991) for Klady, and Korenevskij et al. (2008) for Kudakhurt. The objects contained 10–50% silver. The technology of extraction of primary gold through crushing, fine grinding and panning of the gold bearing rock was practiced in the gold mines of Sakdrisi (Georgia) during the late fourth millennium BC (see Stöllner et al. 2008).

91 For the first gold artefacts on the Iranian plateau see Thornton (2009, 49): "Recent excavations at a Namazga-sequence site near Nishapur called Tepe Borj has uncovered the earliest gold artefact in Iran from a level associated with Namazga I pottery (Garajian pers. comm. 2007)". (For dating Namazga I to 4800–4000 BC see Kohl 1992, 155.) Gold ornaments from Gawra XI may be roughly contemporary (Rothman 2002, Table A.10; Tobler 1950, 193). Gold artefacts were widespread during the fourth millennium BC, e.g. in Iran (small gold beads at Sé Girdan and Sialk, gold wire and sheet at Arisman Area B, a gold jackal figurine and pendants with gold inlays from Susa II; see Muscarella (2003, 117), Chegini et al. (2004, 211), Benoit (2004, 182, Figs. 4, 9, 10 and 11), in Central Asia (gold beads at Sarazm and Kara-depe 3; Isakov 1992, Fig. 3, 14; Masson and Merpert 1982, 28), in Azerbaijan (Akhundov and Makhmudova 2008, 63 f.), in north Mesopotamia (numerous gold ornaments in graves of Level XI-VIII of Tepe Gawra, a hoard of gold and stone beads from the Middle Uruk Level 16 of Area TW at Tell Brak; see Rothman 2002, 65, Table A.10; Emberling and McDonald 2002) and in the Levant (at Nahal Qanah, see Gopher et al. 1990).

92 Selimkhanov (1960; see also see Popova 1963) has conducted spectrographic analyses on 20 heavy copper tools and weapons from the excavations of Veselovskij at the kurgans of Maikop, Kostromskaja, Vozdvizhenskaja and Novosvobodnaja. A dataset published by Chernykh (1966) encompasses 67 artefacts from the region of Kuban. Korenevskij (1984) has published analyses of 77 objects from kurgans at Kishpek, Lechinkaj, Chegem and Nalchik in the central Caucasus (44 of which contained nickel). Data about the chemical composition of copper objects from Klady have been made available by Galibin (1991).

93 For Iran see Thornton (2010); for arsenical copper from the Anau IA period (c. 4500–4200 BC) at Koushut in Turkmenistan see Thornton (2009, 48, with references). For arsenic-rich copper prills embedded in slag from Abu Matar in the northern Negev, dating to c. 4200–4000 BC, see Shugar (1998, 2003).

94 For example at Tepe Yahya VB (c. 3600–3400 BC) (Thornton et al. 2002), Gawra XI (around 4000 BC; Tobler 1950, 212), Tülintepe (beginning of the fourth millennium; Müller-Karpe 1994, 25 f.) and in the south Caucasus at Tekhut (Table in Akhundov 2004) and Leila Tepe (Akhundov 2007b, Table 1). Moreover, studies of slags from sites in Upper Mesopotamia showed that the fourth millennium BC witnessed a major shift from "pure" copper to metal with lower copper content (c. 96–97%) and significant impurities (of iron, nickel, arsenic, and lead). This new raw material was apparently obtained by smelting copper minerals (see Riederer 1994).

95 The earliest evidence for copper-arsenic-nickel alloys dates to the late fifth millennium BC. Studies of slagged crucible fragments from Tal-i Iblis, e.g. identified high concentration of nickel (Pigott 1999a, 110–112). Major deposits of copper-nickel arsenides are located in east Anatolia (Ergani Maden) and in Iran (Talmessi) (Hauptmann 2007, 297 ff.).

96 Contemporary finds originate from Gawra XI (Tobler 1950, 212, Pl. XCVIII, 1). A copper adze from Gawra XI contained 3.49% arsenic and 1.63% nickel (Tobler 1950, 212, Pl. XCVIII, 1).

97 At Arslantepe VII and VI, Tülintepe, Hassek Höyük, Nahal Mishmar (Palmieri et al. 1999, 141; Yalçın 2008, 23; Schmitt-Strecker et al. 1992; Hauptmann 2007, 297).

98 The only exceptions are two finds from a grave at Usatovo; see Chapter 6.

99 Atomic absorption analyses of smelting slags from Tepe Hissar suggest that copper-arsenic alloys were produced during smelting at this site. All samples had high arsenic content (0.3 to 1.80%) and one of the slags contained both nickel (0.3%) and arsenic (Pigott et al. 1982). An experiment conducted at Arslantepe demonstrated that arsenical alloys can be successfully prepared by melting arsenic minerals, e.g. realgar (As_2S_2) together with copper smelted from ores (Palmieri et al. 1993, 597). Archaeological evidence for the latter technique is possibly provided by finds from the fourth-millennium BC layer at Norşuntepe. Ore pieces containing arsenic and antimony were found inside a building (the minerals probably originate from a distant region, Azerbaijan has been proposed as a possible area of origin). The aresnic-bearing minerals were associated with slags that contained neither arsenic nor antimony (Zwicker 1980, 17). These observations were interpreted as evidence for the intentional preparation of arsenical copper by adding arsenic-bearing minerals to molten "pure" copper (Zwicker 1980; Palmieri et al. 1993, 576).

100 Cu-Pb alloys in Susa II/IIIA (Tallon 1987, 318; Malfoy and Menu 1987, 362, Table F; Benoit 2004, 188) date to the later fourth millennium BC.

101 E.g. a lion figurine from Uruk IV containing 9% lead (Heinrich 1936, 25, 47, Pl. 13a; Braun-Holzinger 1984, no. 1) and a pendant from Arslantepe VIA with 9.7% lead (Palmieri et al. 1999, 145, Fig. 7a).

102 For a chisel (Nr 159–50) with 48% copper and 38% silver, and a "crooked" pin (Nr 159–2728) with 7% copper and 68% silver see Galibin (1991); for a dog figurine of 50% copper and 50% silver see Ryndina (2005, 130–133).

103 Three of the beads contained about 30% silver and 7% gold (Akhundov and Makhmudova 2008, 67–68).

104 For example at Uruk-Warka (copper arrowhead from the "Riemchengebäude" of the late Uruk period, containing 40–65% silver) (Pernicka 1993, 314 f., Fig. 16, W.18725m) and at Arslantepe VIB (28 copper objects found in the "Royal tomb" of the early third millennium BC, most with a silver content of c. 50%) (Frangipane et al. 2001, 130).

105 So far no finds of such moulds have been made in the north Caucasus. For clay moulds for shaft-hole axes from the lower Don (Konstantinovskoe) and Dnepr (Verkhnaja Maevka) see Chapter 5.

106 For example items in the hoard of Nahal Mishmar in the Judean desert (Tadmor et al. 1995); a copper lion figurine and silver figurines of lying bovids on lapis lazuli cylinder seals in Sammelfund Pa XVI_2 from the Jemdet Nasr period at Uruk-Warka (Braun-Holzinger 1984); a gold pendant in the shape of a dog, a smaller silver dog, and pins with figural heads from Susa II, 3300–3100 BC (Benoit 2004, 187, Figs. 4 and 13; Tallon 1987, No. 1161–1162). Lost-wax was practiced at sites in south Turkmenistan dating to the Namazga III period, late fourth millennium BC (Terekhova 1981, 317).

107 The technique of annealing is attested at least by the Sialk II period or the fifth millennium BC in west Iran (Moorey 1985, 39).

108 The hammering of gold into wire and foil was practiced on the Iranian plateau and in northern Mesopotamia during the fourth millennium BC. Pieces of gold sheet and wire have been found at Arisman Area B dating to the Sialk III period (Chegini et al. 2004, 211). Gold foil rosettes were recovered from tombs of the early and mid-Uruk periods at Gawra X-VIII (Tobler 1950, Pl. LVIII, LIX).

109 For rings see Korenevskij (2004, Fig. 90, 2–5) and for foil see Korenevskij (2004, Fig. 90, 8, Fig. 99, 5). Bead shapes include small disc beads (for an ingenious

method of producing identical small ring beads see Echt et al. 1991, 650, Fig. 7), small solid beads with ribbed surfaces, and hollow beads with spherical or biconical shapes and plain, faceted or ribbed surfaces (see Korenevskij 2004, Fig. 90).

110 A "soldered seam", cf. Moorey (1985, 88). See also Echt et al. (1991, 649, 653) for Varna (*Kaltschweißnaht*).

111 For comparisons of this technique see e.g. the finds from a child's grave at Kara-depe 3 (large beads of gold foil over a plaster core; Masson and Merpert 1982, 28) from Kurgan 1/2006 at Soyuq Bulaq (silver beads with paste core; Akhundov and Makhmudova 2008, 64), and from Tepe Sialk IV.1 (biconical silver beads with a core of bitumen; Ghirshman 1938, 125, Pl. XXX, 1; Stöllner et al. 2004, Cat. No. 134). Beads with cores of bitumen or paste have no parallels in north Mesopotamia, but the technique was apparently practiced there for other artefacts of gold foil, like e.g. the tiny object in the shape of a wolf's head from Tomb 114 at Tepe Gawra X, dating to the early fourth millennium BC, which was made of gold foil over a bitumen core (Tobler 1950, 92, Fig. 65); a figure of a goat of gold sheet with a bitumen core was part of Sammelfund Pa XVI_2 from the Eanna area, dating to the Jemdet Nasr period (Braun-Holzinger 1984).

112 A similar "trick" was used for treating low content silver coins in Roman times.

113 Flat axes were recovered from a damaged grave on the coast of the Krasnodar reservoir near Taujkhabl/Chishkho (Rezepkin 2000, 71 f., Pl. 77, 3), from Krasnogvardejskoe (Munchaev 1994, Fig. 54, 9), from Temrjuk 1/3 (Korenevskij 2004, 53), from Vozdvizhenskaja Grave 2 (Veselovskij 1902, Fig. 79), and from Grave 2 at Psekup (Lovpache 1985, Pl. IV). For comparisons with other parts of the north Caucasus see Munchaev (1994, Pl. 54). Tanged daggers were recovered from Grave 2 at Psekup, Timashevsk, Krasnogvardejskoe, Temrjuk II 1/1, Chernyshev II 1/1 and Novokorshunskaja 2/19 (Trifonov 1991, Fig. 6, 15–17; Lovpache 1985, Pl. IV, 5; Munchaev 1994, Fig. 53, 9; Bianki and Dneprovskij 1988, 75, Figs. 3, 6 and 7; Rezepkin 2000, 74, Pl. 82, 6).

114 For comparisons in other parts of the north Caucasus (at Nalchik, Klady and Maikop) see Munchaev (1994, Pl. 54) and Korenevskij (2004, Fig. 81, 8).

115 See Korenevskij (2008b, 13), who describes this type as "archaic" and maintains that it has been found mainly in the earliest assemblages.

116 For examples of shaft-hole axes see Munchaev (1994, Pl. 47). The "poker-butt" spearhead has close comparisons at sites in the piedmont (e.g. in Psebajskaja and Tsarskaja; Popova 1963, Pl. XI; Veselovskij 1901, Pl. IV, 49); the hoes have parallels at Zamankul, Maikop and Galjugaj (Korenevskij and Rostunov 2004, Fig. 7, 4; Veselovskij 1900a, Fig. 34; Korenevskij 1995, Fig. 85). A characteristic but seldom copper tool of this period, which has not been reported yet from the Azov-Kuban region, is the pickaxe (e.g. the specimen from Lechinkaj in the central Caucasus). Pickaxes have been recovered in the south Caucasus and west Iran (for summary and comparisons see Batchaev and Korenevskij 1980). An identical pickaxe was discovered at Veremie in the valley of Dnepr. This copper artefact, which was obviously of Caucasian origin, contains both arsenic and nickel and dates to the early fourth millennium BC (the Tripolie B2 phase) (see Ryndina 2003, 15, Fig. 3, 1).

117 These artefacts have a very close parallel at Klady 31/3 (Rezepkin 2000, Pl. 54, 13).

118 Among the earliest flat axes dating to the early fifth millennium are the small, elongated specimens from Mersin XVI (c. 5000 BC; Yalçın 2000a), Susa I (4200–3800 BC; Tallon 1987, Fig. 48), Arpachiyah (disturbed layer, possibly Ubaid or later; Schoop 1995, 20, 100), and Tepe Gawra XII and XI (4200–4000 BC; Tobler 1950, 213, Pl. XCVIII, a, 1.2). These artefacts, however, are not directly related to the flat axes from the north Caucasus.

119 Long narrow flat axes represent a different type which was widely used in the fourth and third millenniums BC in eastern, central and western Anatolia (see Chapter 7) and apparently also in western Iran (Se Girdan; Muscarella 2003, Fig. 5) and in the south Caucasus (Martirosjan and Mnatsakanjan 1973).

120 Thornton (2009, 23, note 2) suggests that the tanged daggers from Hissar I date to phases A and B: "Although described as 'Hissar IC' by Schmidt, the burials containing these daggers (see Schmidt 1937, 82–83) were rather simple, contained pottery only of the Hissar IA-B type, and were found quite deep (up to 6,75 m below datum). This, in addition to the well-attested presence of copper-base daggers in the late fifth millennium at Sialk and elsewhere, leads me to suggest that these burials may in fact date to ca. 4000 B.C.E.)".

121 Other small blades dating to the fifth millennium BC include the finds from Tekhut (Masson and Metrpert 1982, 122 ff., Pl. XLVIII, 11), and Kjul Tepe I (Masson and Metrpert 1982, Pl. XLII, 19; see also Kavtaradze 1999).

122 It seems rather unlikely that the north Caucasian daggers derive from the earliest daggers in southeast Europe (type Bodrogkeresztur; see Chapter 6), since all other metal types are obviously Middle Eastern in origin.

123 According to Müller-Karpe (2002, 138), they closely resemble the late Ubaid clay models in south Mesopotamia. For clay shafthole axes see Moorey (1969, 133, with references; 1994, 256).

124 For unprovenanced finds from the south Caucasus, comparable in shape to the shafthole axes of the Maikop period, see Korenevskij (2008a, 96, Abb. 11, 1).

125 For comparisons of these items with those in other parts of the north Caucasus see Munchaev (1994).

126 At Ulskij 5/5 and in a destroyed grave near Taujkhabl/Chishkho (see Trifonov 1991, Fig. 6; Rezepkin 2000, 71 f., Pl. 77, 2).

127 Moreover, copper discs ("mirrors") dating to the fourth millennium BC have been recovered at sites in the Kopet Dag piedmont, e.g. at Ilgynly-depe level IV (Solovyova et al. 1994, 33, Fig. 1, 6), Geoksyur 1 (Masson and Metrpert 1982, Pl. VIII, 18.19) as well as at Susa I (Tallon 1987, 290, Nos. 1230 and 1231).

128 Excavations in the region of Kuban yielded 115 graves of the early third millennium BC (Novotitorovskaja culture) with whole wagons or their parts (Gej 2004, 177). One of every 8 graves in the Kuban group contained a wooden wagon, but only 17 wagons were found in 2156 graves of the Jamnaja culture in the northwest Black Sea region (Turetskij 2004, 195 f.).

129 Clay wheels with nave were most probably spindle whorls (see the section titled "Weaving Crafts" in this chapter).

130 In the original publication of Kondrashev and Rezepkin (1988) the name of the site is "Starokorsunskaja" (in rajon Dinskaja, Krasnodar). Later, Rezepkin published the same find as "Novokorsunskaja" (Rezepkin 2000, 74, pl. 81, 6; 2005, 235). The latter name is also used in the present study.

131 The vessels are shaped from clay with shell admixture, hand-made, and have the typical black burnished surface and shape (Kondrashev and Rezepkin 1988, 93, Fig. 2, 8.9).

132 Korenevskij (2004, 99, note 3) points at the poor state of preservation of the find from Novokorsunskaja and doubts that it indeed represents the remains of a wagon.

133 Evidence for four-wheelers in Mesopotamia predating 3000 BC includes wagon pictogramms inscribed on clay tablets of the Late Uruk and Jemdet Nasr periods at Uruk-Warka (see Bakker et al. 1999, 778, Fig. 2, with references). A wall painting of two oxen and a coachman driving one of them on reins in Temple B, Corridor A 796 at Arslantepe VIA (Frangipane 1997, 64, Abb. 15) certainly depicts the pole-and-yoke draught system, but it is not clear whether the animals are pulling an ard, a sledge or a wheeled vehicle (since the lower part of

the wall painting was not preserved). For contemporary evidence from Europe see Sherratt (2006, with references).

134 Both in the Indus valley and in Turkmenistan such clay models are more numerous at sites of the early third millennium BC. Nearly identical clay models of two-wheeled carts with two oxen and a pole-and-yoke draught originate from the Kura-Arax period sites at Badaani in Georgia (Mirzchulawa 2001, 254) and Arich in Armenia (see Khachatryan 1975, 73, Figs. 35 and 37), both dating most probably to the early third millennium BC, as well as from the EBIII level (2400–2100 BC) at Arslantepe (Frangipane 1993, 88).

135 At Nalchik, Kishpek, Grave 195 at Ipatovo, Zolotarevka 25/7; see Korenevskij et al. (2007, 105), Korenevskij and Kalmykov (2006) and Chechenov (1970, 115 ff.; 1984, 211–220).

136 See Earle (1997, 74): "Control over wealth can be highly problematic; as its value increases, a strong pressure builds to smuggle goods outside of established networks and to produce fakes outside of recognized craft shops. At the same time, the value can be destabilized through inflation or cultural disruption."

137 For a definition of "feast" see Dietler (2001, 67): "[A] form of public ritual activity centred around the communal consumption of food and drink".

138 Preservation of the body of prominent deceased for the long period of preparation and duration of the burial ceremonies seems essential. Sumptuous graves at Tsarskaja and Maikop contained large quantities of two minerals of mercury (mercury sulphide, cinnabar) and lead (lead tetroxide, minium) (Alexandrovskaja et al. 2000, 111, Table 3; Veselovskij 1897 [1997], 44). Arsenic, lead and mercury delay the decay processes in soft tissues by inactivating enzyme systems (since they have the same action in living organisms, minerals of these metals are highly poisonous when inhaled or absorbed through the skin) and are used for mummification (see Aufderheide 2004, 50 f.). It seems possible that in the north Caucasus cinnabar and minium were appreciated not only for their vibrant red colour but also for their ability to slow down the process of decay.

139 At Novosvobodnaja, Bamut, and Inozemtsevo (see Iljukov 1979; Korenevskij and Petrenko 1982, Fig. 8, 11.13.14). It has been suggested by Iljukov that the "forks" were used for taking meat out of the cauldron. See also Davidson (1999, 152) about Celtic warrior feasting, involving the use of cauldrons for boiling meat, and flesh-forks.

140 But probably not beer. Traditional homemade beer is consumed with straws from a pot and not drunk from a cup, because a layer of yeast covers the surface of the unfiltered beverage (see Katz and Voigt 1986, 29). For illustrations see Katz and Voigt (1986, Fig. 6a [drinking scene in contemporary Kenya], Fig. 7 [lapis lazuli cylinder seal from the Royal cemetery at Ur, Early Dynastic period], Fig. 10 [sealing from Tepe Gawra c. 4000 BC]).

141 Interestingly, the genetic diversity of domestic *Saccharomyces cerevisiae*, the yeast species involved in food fermentation, suggests an origin of most yeast strains in southwest Asia (Legras et al. 2007). Among the earliest chemical evidence for wine are residues of tattaric acid on pottery sherds from early-sixth-millennium Shulaveris gora in the Kura basin (McGovern 2003, 75) and from Hajji Firuz Tepe in the north Zagros Mountains, dating to c. 5400–5000 BC (McGovern et al. 1996a). Wine residues dating to the late Uruk period have been identified on pottery vessels from Uruk-Warka (a characteristic droop-spouted jar; see Badler et al. 1996) and from late Uruk-related sites in west Iran like Susa and Godin Tepe V (piriform jars and droop-spouted jars; McGovern et al. 1997; McGovern and Michel 1996). See also Barnard et al. (2011) for wine residues from Areni-1 in Armenia dating to c. 4000 BC. These results are in agreement with research on the genetic background of the Eurasian grapevines (*Vitis vinifera* L.), which suggests two regions of domestication, one of them in southwest Asia (and the other in the western Mediterranean) (Arroyo-García et al. 2006). The earliest

indirect indication for beer is the previously mentioned sealing with depiction of a drinking scene from Tepe Gawra dating to c. 4000 BC (Katz and Voigt 1986, Fig. 10). Chemical evidence for beer (in the form of calcium oxalate or "beer-stone" on pottery sherds) is available from the late Uruk levels at Godin Tepe (Michel et al. 1992).

142 For the earliest chemical evidence for a fermented honey drink see McGovern et al. (2004).

143 Alexandrovskaja et al. (2000) have determined that red pigments from catacomb graves at Zunda Tolga in the Manych steppe originate from three different cinnabar deposits – the Donets valley, the Caspian shore and Chechenia.

144 The possible association of this red pigment with central Asia appears less extraordinary if we consider the fabric itself, which was tablet-woven from a wool-cotton blend. Moreover, several north Caucasian graves provided ornaments of exotic stones, which also might originate from central Asian sources. Minium, cinnabar and montroydite are very toxic and can be absorbed through the skin.

145 Both the practice of engraving stone and the idea of stamping or sealing were foreign to the societies of the north Caucasus. Among the earliest sealings of cylinder seals from secure stratified contexts are the finds from Level 10 at Tell Sheikh Hassan on the Upper Euphrates and from Sharafabad in the vicinity of Susa, both dating to the mid-Uruk period (Akkermans and Schwartz 2003, 196; Pittman 1994, 25, with references). The appearance of cylinder seal impressions at Tell Brak also dates to the mid-Uruk period and predates the adoption of Uruk-style pottery at this site: sealings of cylinder seals appear in Level 5 of sounding HS1 along with traditional stamp seals; a gradual change from stamp seals to cylinder seals was observed in area TW. The same gradual change also took place at other mid-Uruk sites (see Felli 2000, 415). For the earliest impressions of cylinder seals at Uruk-Warka see Boehmer (1999).

146 Though he also acknowledges a certain "influence" of the art and style of the Uruk period in Mesopotamia (Korenevskij 2001, 46). See also Masson (1997, 80), who admits that the lion applications are imports but argues that the silver cup was locally made in the north Caucasus and the lion depictions on it only imitate foreign models.

147 Korenevskij (2001, 49) is basically wrong in believing that all animals depicted on the cups may have been native to the north Caucasus. He also implies that, even if they have not actually seen some of the animals in life, the north Caucasian artisans were still able to depict them (since these animals were certainly present in the "homeland" of the Maikop culture, which he locates in the Near East). However, in my opinion the exact and realistic nature of the animal portrayals shows that their authors did not simply copy traditional models but must have intimately known and continuously observed the animals in their natural habitat.

148 Aurochs and wild horse (*Equus caballus*) are now extinct, but their bones have been found in settlements of the Maikop period (see the section titled "Farmers and Pastoralists on the Lower Kuban" in this chapter).

149 Korenevskij's (2001, 47) identification of this animal as a wild donkey is not correct; see Uerpmann and Uerpmann (2010, 243 f.). Single horse bones were present at prehistoric sites in the south Caucasus and east Anatolia: in Armenia and Azerbaijan at fifth millennium BC Tekhut and Alikemek Tepesi (Kushnareva 1997, 174) and on the Upper Euphrates at fourth-millennium Norşuntepe, Tülintepe, Tepecik, Arslantepe, and Değirmentepe (Bökönyi 1991). Kushnareva (1997, 174) and Bökönyi (1991) assume that wild horses disappeared in southwest Asia and the south Caucasus at the beginning of the Holocene and therefore all horse bones at Holocene sites belong to domestic animals. However, recent evidence suggests that wild horses lived in central Anatolia during the entire Holocene (e.g. bones from the neolithic sites at Çatalhöyük and Aşıklı) and

their absence in the eastern part of Anatolia before 4000 BC is due to lack of investigations (Vila 2006, 119). Support of the thesis that wild horses inhabited the region south of the Caucasus give horse bones at several early prehistoric sites on the north Iranian plateau, e.g. the sixth-millennium site Tepe Zaghe and the fourth-millennium site Ghabristan in the Qazvin plain (Mashkour 2003, 133–135).

150 For the historical and present-day range of lions see also http://lynx.uio.no/lynx/catsgportal/cat-website/catfolk/asaleof1.htm, with references.

151 A goitred gazelle was also identified at the prehistoric site of Shengavit in Armenia by Uerpmann and Uerpmann (2010, 245). The species is not present in Anatolian bone assemblages.

152 Among them, the European mouflon is not a genuine species of wild sheep but the feral descendent of early domestic sheep (see Hiendleder et al. 1998, 119). *Ovis musimon/orientalis* have a karyotype of 2n = 54 chromosomes, *Ovis ammon* 2n = 56 and *Ovis vignei* has 2n = 58.

153 The present-day distribution of the European mouflon is limited to the islands of Corsica and Sardinia. Asiatic wild sheep still live in the Zagros mountains, in the mountainous regions of Anatolia and some in the sparsely forested areas of the Lesser Caucasus. Uerpmann and Uerpmann (2010, 246) emphasize that the dispersal of this species to the ranges of the Greater Caucasus and beyond was impeded by extensive areas covered with thick forests. Urial sheep inhabit the southern parts and Argali the northern parts of inner Asia.

154 Strikingly, the animals on the silver vessel seem to wear collars. Cheetahs do not breed in captivity, but they can be easily tamed and raised among humans. Tamed cheetahs behave like dogs and can be trained for hunting, similar to falcons. The earliest evidence of tamed cheetahs comes from reliefs in mid-second-millennium Egypt, while the practice of “royal hunting” with cheetahs is documented in historical times for pre-Islamic Persia and became very popular in Iran during the Middle Ages (Allsen 2006, 73–82).

155 The bearded bulls have comparisons in proto-dynastic Mesopotamia at the Royal Cemetery of Ur (Tosi and Wardak 1972, 16, Fig. 2 a); the bowl with depictions of sturdy bulls reminds artefacts of the Larsa period, 2000–1800 BC (Tosi and Wardak 1972, 15, Fig. 5a, 11).

156 Minor deposits with traces of ancient mining are also located on the fringes of the Kerman Mountains near Yazd and Kerman (near the site of Tal-i Iblis) (Schoop 1995, 68).

157 For the use of turquoise during the PPNB (eighth millennium BC) in the Levant see Schoop (1995, 68). However, turquoise from PPNB sites in the Levant originated most probably from the Sinai and not from the deposits of central Asia. Turquoise beads are rare finds at sites of the seventh and sixth millenniums BC in north Mesopotamia (see Schoop 1995, 68 f.; Weisgerber 2004, 70). Moreover, supply for this region was apparently interrupted after the Halaf period (Schoop 1995, 69).

158 In the second half of the fourth millennium BC turquoise was widely spread in central Asia; beads have been reported e.g. from Geoksjur-depe 1 (Geoksjur phase; Müller-Karpe 1984, 62, Fig. 24, 5), a rich grave at Altyntepe 10 (Namazga III period; Masson 1981, 67), and Grave 5 at Sarazm (c. 3600–3000 BC; Isakov 1992).

159 Samples from Shahr-i Sokhta originated from Chagai, Sar-i Sang and from a third deposit located possibly in the Pamir Mountains (as demonstrated by chemical analysis for trace elements by atomic absorption spectroscopy of artefacts and samples from the mining sites; Casanova 1992; Delmas and Casanova 1990).

160 Among the earliest finds in Mesopotamia are beads from Yarim Tepe I Level 8 (Hassuna period), Samarra (mid-Samarra period), and Tell Arpachiyah (Halaf period) (Schoop 1995, 71 f.); the earliest artefacts of lapis lazuli in the Indo-Pakistani region are beads from Mehrgarh dating to the seventh and

sixth millenniums BC (Barthelemy de Saizieu and Casanova 1993, 17); examples of early finds in central Asia and north Iran are beads from graves at Tappeh Zagheh and from the settlement mound Anau North (5300–4200 BC; Fazeli 2004, 195; Kurbansakhatov 1987, 91, Fig. 44, 1).

161 Also at Zhukov, an excavation of the University of Samarkand in the 1990s (L. Kircho, personal communication, November 2010).

162 Lapis lazuli was nearly absent in Mesopotamia during the late Uruk and Jemdet Nasr periods (among the very few finds are those from Jemdet Nasr levels at Uruk-Warka, Telloh and Brak; Moorey 1994, 78, 88 f.).

163 It is important to emphasize that, in contrast to turquoise and lapis lazuli, carnelian is often found in secondary deposits and can be collected easily in the form of pebbles along riverbeds (see Barthelemy de Saizieu and Casanova 1993, 17). Therefore, supply with carnelian for manufacturing small items, like beads, is associated neither with localized deposits nor with laborious quarrying. Nodules of up to 1 kg for high-quality large beads can be obtained by subsurface extraction through shafts; the most important carnelian mines in the Old World are situated in the province of Gujarat in Western India (see Insoll and Bhan 2001).

164 The use of carnelian and rock crystal in the Middle East became widespread at the turn of the fifth to the fourth millennium BC (for carnelian in the PPNB, Hassuna and Halaf periods see Schoop 1995, 70). Workshops for beads of carnelian, lapis and turquoise were excavated at Mehrgarh, Period III (dating to the later fifth and first half of the fourth millenniums BC) (Samzun 1988, 126). Single carnelian beads were recovered at Alikemek Tepesi in Azerbaijan (in the contexts of Ubaid-related pottery of the late fifth millennium BC, see Kiguradze and Sagona 2003, 89), at Geoksyur-tepe in Turkmenistan (several carnelian beads from layers of the Geoksjur phase; Müller-Karpe 1984, Fig. 24, 9–17), and at Mundigak II near Kandahar (two beads from a context contemporary with the Namazga III period; Casal 1960, 241 No. 7). Large collections of beads made of several precious materials are common: a child's grave at Kara-depe 3 (Namazga II period) contained 249 beads of turquoise, carnelian, lapis, and gold (Masson and Merpert 1982, 28); the graves at Sarazm II (Namazga III period) provided an enormous collection of silver, gold, carnelian, lazurite and turquoise beads (Isakov 1992); Layer IV at Sialk, dating to the late fourth millennium BC, contained intricate jewelry of gold, silver, lapis lazuli, quartz, shell, carnelian and rock crystal (Ghirshman 1938, Pl. XXX, 1; Benoit 2004, Fig. 11); a cache from Area TW, Level 16 (Middle Uruk) at Tell Brak consisted of 360 beads of precious metals and stones, mainly carnelian but also of gold, silver, lapis, amethyst, and rock crystal (Emberling and McDonald 2002). For other sites in north Mesopotamia see Rothman (2002) (graves at Gawra XI-XA) and Matthews and Fazeli (2004, 71) (beads of carnelian, lapis lazuli, and gold at Grai Resh). For a workshop for rock crystal and carnelian artefacts at Uruk-Warka see Weisberger (2004, 72).

165 Chaff-faced ware (the "Amuq F period") was first identified by Braidwood and Braidwood (1960) during investigations in the plain of Antakya.

166 The first finds of the "Leilatepe culture" were recovered at Uch Tepe in 1956–1960, and later at Telmankend and Dyubendi. The site of Leilatepe was excavated in 1984–1990. Between 2004 and 2006, rescue excavations along the Baku-Ceyhan pipeline in the region of Akstafa at Boyuk Kesik, Soyuq Bulaq, and Poylu brought more material of this type (Akhundov 2007a; Akhundov and Makhmudova 2008). Similar material has been identified in the highlands of east Anatolia and northwest Iran (Marro 2007). ^{14}C dates are available from Boyuk Kesik (Müseyibli 2007, 150 f.): five charcoal samples gave values ranging between 3900 and 3600 BC (the ^{14}C dates from Berikldeebi are in the same range; see Kiguradze and Sagona 2003, note 1).

167 Sites of the fifth millennium BC (e.g. Godedzor and Kjul Tepe) provided only a few metal objects and manufacturing debris. Arsenical copper was used in the

Arax basin already during the fifth millennium BC, e.g. at Kjul Tepe and Tekhut. Only two artefacts from Kjul Tepe contained arsenic (1.14% and 1.15%, respectively), but most of the analyzed objects from Tekhut had arsenic contents of 3% to 5% (see table in Akhundov 2004). From the Araxes basin knowledge of metallurgy possibly spread to the north into the valley of the Middle Kura basin during the fourth millennium (Chataigner 1995, 129, with references). Workshops with horseshoe-shaped furnaces, charcoal in large ceramic vessels, clay tuyeres, slags, and clay moulds were excavated at the late-fourth-millennium sites of Amiranis Gora and Baba Dervish II (Kavtaradze 1999, 74).

168 Previously associated with the late Uruk period of the late fourth millennium BC, recent research views the "Uruk expansion" as a very gradual process, which began around 3700 BC by small colonies interacting with the indigenous communities (see Rothman 2004, 93, with references).

169 Compare the distribution of Kura-Arax sites (e.g. Rothman 2005, Fig. 2) with that of sites of the "Upper Mesopotamian expansion" of the early fourth millennium (e.g. Marro 2007, Map 1).

170 The bone pin with a flat triangular head from Ust Dzheguta (Munchaev 1994, Pl. 48, 52) is very similar to a copper pin from the cemetery of Parkhai II in the Sumbar Valley of west Turkmenistan (SWT-VII period, early fourth millennium BC; Thornton 2009, 49, Fig. 2.17).

171 Lapis at Sarazm I, Mehrgarh and Kara-depe 2–3 (see the section titled "Long-Distance Trade" in this chapter); painted pottery at Sarazm I (Kircho, personal communication, November 2010) and Mehrgarh III (Samzun 1988); "handbag" weights at Ilgynli-depe (first half of the fourth millennium; Kircho, personal communication, November 2010), Anau II (Namazga II period; Masson and Merpert 1982, Pl. XV, 19), and Mundigak I, 5 (Casal 1961, Fig. 135, 4). See Alekshin (1973) with interpretation of these peculiar objects as weights for grain (they remained in use during the Bronze Age).

172 For the dating of Namazga III see Masson (1981, 81–85). ^{14}C dates are available for Geoksyur 1 and Altyn-depe, and date the late Namazga II (Yalangach) period to c. 3810 BC and the early Namazga III period to c. 3410–3240 BC.

173 Differences from the north Caucasian graves include the use of slab stones or mudbrick lining (in the north Caucasus tombs were instead lined with river boulders or wood), the rarity of pottery vessels in the southern graves and the relative scarcity of remains of funeral feasts like, e.g., sherds, fire, charcoal, and animal bones in the vicinity of the tomb.

174 There are two major crossings in the main range of the Caucasus, Dariel in Osetia and Derbent in Daghestan. Historical sources report that the passes were easy to travel, at least for invading nomads of the north. Herodotus (IV, 12) accounts that the Cimmerians moved along the coast of the Black Sea to Sinope; the Scythians, however, took on their way to Iran the route on the Caspian side through Derbent. Hun invasions in the sixth century AD forced Persia to invest much effort in the defense of the passes, since both Dariel and Derbent were seriously threatened by the nomads (Ball 2011, 124).

175 Müseyibli (2005, 136) maintains that these practices originated in the valley of Kura.

5. THE NORTH BLACK SEA GRASSLAND

1 If not otherwise cited, the information originates from the catalogue of J. Rassamakin (2004b).

2 The ceramics from the lowest level at Mikhajlovka were correlated with pots from graves at Osokorovka (Graves 12 and 7), Zolotaja Balka, Kurgan 2 at Grushevka, and Kurgan 13 at Akkermen near Novopilippovka (Lagodovskaja et al. 1962, 34 f.).

3 Other field expeditions (mostly for rescue excavations in connection with irrigation projects) include, from west to east, the Kalinovka expedition of the Nikolaevskij Regional Museum on Ingul in 1983 directed by Nikitin (unpublished; see Rassamakin 2004b, 128 f.); the excavations at Novoalexeevka near Skadovsk conducted by Zbenovich in 1972 (unpublished; see Rassamakin 2004b, 116 f., 162); fieldwork at Vinogradnoe on Molochnaja directed by Rassamakin in 1981–1982 as part of the Zaporozhskaja expedition of the Institute of Archaeology at Kiev (Rassamakin 1987); and the excavations at Primorskoe on Kalmius by Beljaev in 1976, which were part of the Donetskaja expedition of the Institute of Archaeology at Kiev (unpublished; see Rassamakin 2004b, 138, 159).

4 Ozernoe was excavated by Evdokimov and Kuprij in 1994 (in connection with irrigation in the region of Kherson) (Rassamakin 2004b, 116, 145; Rassamakin and Evdokimov 2010); Samar and Antonov from the Zaporyzha Direction of Antiquities explored kurgans at Vishnevatoe in 1996 (unpublished; see Rassamakin 2004b, 10, 139).

5 Rare exceptions are Vinogradnoe (Rassamakin 1987, 1988), the north Crimea excavations in 1963 (Shchepinskij and Cherepanova 1969), and some rescue excavations in the north Crimea (Koltukhov and Toshchev 1998; Kolotukhin and Toshchev 2000). The data used in the present study are derived from the catalogue of Rassamakin (2004b).

6 For a full discussion see Rassamakin (1999; 2004a, 1–12).

7 Rassamakin (1988, 1993, 1994, 1999, 2002a, 2004a).

8 Danilenko (1974, 93–106) maintains that the "horse-head scepters", the presence of numerous horse bones in Dereivka and Repin, the bone artefacts interpreted by him as cheekpieces, and the economy (based assumingly on herding) are clear indications of the rise of steppe nomadism during the fifth millennium BC. For a contradiction see Levine (2005, 7–11) and Dietz (1992).

9 In the coastal part of the steppe such bone beads have been reported from Vishnevatoe 2/2, Novoandreevka 4/2, Vinogradnoe 2/2, and Tankovoe 9/15 (Rassamakin 2004a, Abb. 114; 2004b, 9, 10, 15, 144).

10 The bone samples from the middle level were taken from squares 14/XXXII (Ki-8012, 4710±80) and 17/LII (Ki-8186, 4480±70 and Ki-8010, 4570±80). Ki-8012 was taken from the lower part of Level II, while Ki-8186 and Ki-8010 originate from its upper part.

11 The number of graves in the steppe between Molochnaja and Dnepr slowly increased in the course of the third millennium BC (Otroschenko and Boltrik 1982). However, a marked rise in the number of sites away from the rivers began only in the early second millennium (Mnogovalikovaja, an archaeological culture that is regarded as sedentary). Otroschenko and Boltrik interpreted this pattern as evidence of a population increase and the spread of settled life into less hospitable environments.

12 Series of shell middens have been investigated on the southern coast of the Crimea (Burov 1995). The middens contained marine mollusks (predominantly mussels, rarely oysters and limpets), bones of mammals and fish, flint tools, and a few pottery sherds. Shell middens at Laspi included numerous flint drills for opening shells (Telegin and Kotova 2006). The dating of the shell middens is problematic (see Wechler 2001, 127). One ^{14}C date is available from Gursuf, but there is no exact information about the nature of the sample (Burov 1995, 321). Pottery with cord decorations found at Laspi is comparable to corded pottery from fourth-millennium BC sites in the coastal region of Ukraine (Telegin and Kotova 2006).

13 Stone cists were recovered, e.g. at Konstantinovka, Ljubimovka 14/7, Novovorontsovka 1/8, Zolotaja Balka, Baratovka 1/16 and 1/17, Starogorozheno 1/28b, 1/11, 1/8, and Sokolovka 1/6 and 1/6a. Cists have not been excavated at

sites of the Usatovo group, while the stone cists in the north Caucasus are of a completely different type (see Chapter 4).

14 Ochre was unusual only in graves of Rassamakin's Group IIIC (with flexed skeletons placed on the right side); see Rassamakin (2004a, 58).

15 Slabs were used at Vasilevka 2/10 (Rassamakin 2004b, 138, Pl. 432), Grave 6 at Orekhov Tarasova mogila (Rassamakin 2004b, 11, Pl. 23), Kurgan 13 at Akkermen I (Rassamakin 2004b, 13, Pl. 31), Grave 7 at Osokorovka (Rassamakin 2004b, 53, Pl. 165), Vishnevatoe 2/4 (Rassamakin 2004b, 139, Pl. 433), Sokolovka 1/6 and 1/6a (Rassamakin 2004b, 97, Pl. 319); wood at Volchanskoe I 1/21, Volchanskoe II 1/5 (Rassamakin 2004b, 140–141, Pl. 348). A pile of stones covered the graves of Starogorozheno 1/8 and Ordzhonikidze "Chkalovskaja" 3/19 (Rassamakin 2004a, Fig. 40, 5; Rassamakin 2004b, Pl. 412). Moreover, together with the usual pits and stone cists, graves of Group IIIIC (with flexed skeletons placed on the right side) may also have ledges and catacombs, e.g. Vinogradnoe 2/14, Volchanskoe I 1/30 and Volchanskoe II 1/6 (Rassamakin 2004a, Fig. 47).

16 There are minor differences in details of ritual, e.g. the number of graves or frequency of stone circles, ditches, and remains of funeral feasts.

17 A stone circle of standing stone slabs (some up to 2 m long) 9 m in diameter in Kurgan 2 at Vasilevka (Rassamakin 2004b, 8, Pl. 16); comparable circles with diameters of 10 m in Kurgan 1 at Velikaja Alexandrovka 1/24 and Kurgan 4 at Kalinovka II (Rassamakin 2004b, Pl. 400 and 409); a circle of irregular rocks and a stone heap at Ordzonikidze "Chkalovskaja" 3/19 (Rassamakin 2004a, Fig. 40, 5); ditches at Kurgan 8 of Kamenka Dneprovskaja, Kurgan 1 of Sergeevka II, Kurgan 1 at Vasilevka, Kurgan 14 and 20 at Vinogradnoe (Rassamakin 2004a, Fig. 13, 3.4.5, Fig. 41, 1.2).

18 For example in Kurgan 2 at Vasilevka (Rassamakin 2004b, 8 f., Pl. 16; see also Rassamakin 2004a, 25, 40, 45, 51 f., 54). For fragments of very large Kvitjana-type vessels near graves see Rassamakin (2004a, 67 f., Fig. 55).

19 For example, the sites of Ljubimovka, Akkermen and Vinogradnoe, which contained two or three kurgans with graves dating to the fourth millennium BC (Rassamakin 2004b, 13 f., 15 f., 121 f.).

20 The soil cover of the north Black Sea plains consists mainly of chernozem; brown chestnut soils and saline soils are found in some arid areas in the south (Ievlev 1991, 21). However, the pockets of lighter soils in the river valleys were probably more suitable for tillage than the chernozems of the watersheds.

21 An antler "Streitpickel" has been reported from Kamenka Dneprovskaja 12/2 (Rassamakin 2004a, 117, Fig. 95, 8).

22 Based on studies of pottery sherds from Mikhajlovka (2.461 sherds from Mikhajlovka I and 3.629 sherds from Mikhajlovka II). Moreover, according to Bibikov (1962, 12), a sickle blade with retouch and sickle gloss was found at Mikhajlovka.

23 See Pashkevich (1997, 267): "Common millet is the preferred staple food amongst traditional nomadic tribes, who appreciate its special qualities – a small sowing bulk, short life-cycle and drought resistance". A grave of the Zhivotilovo-Volchansk group at Vishnevatoe 2/4 contained imported vessels of late Tripolie (Kasperovtsy)–type with imprints of a barley husk and grains of millet and emmer (Rassamakin 1999, 97).

24 Moreover, Ingold (1980, 176) argues that this mode of food procurement is actually inferior to hunting. A major concern in the management of dry uncultivable grasslands for herding is the prevention of overuse, which leads to reduced biodiversity, drier conditions and erosion. Pasture rotation and an adjusted number of animals can reduce overuse. Large herds for meat (and wool) make sense only in a market economy, as in the previous example of the colonists, or if other secondary products are exploited (e.g. reindeer pastoralism in the tundra with exploitation for meat, milk and labour; see Ingold 1980, 186–188).

25 See Ingold (1980, 176): "Milch pastoralism represents the most efficient possible use of uncultivable grazing land, if measured in terms of population carrying capacity".

26 One hundred and four fragments of horse bones (out of 1.160 animal bones) were identified at Mikhajlovka (Bibikova and Shevchenko 1962). The abundance of horse bones in a faunal assemblage is not a secure proof of the assemblage's domestic status. Large numbers of horse bones also appear at earlier sites in the grasslands north of the Danube delta, e.g. horse bones at sites of the in Bolgrad-Aldeni and Tripolie A groups, dating to the mid-fifth millennium BC, constitute between 2% and 16% of the animal bones (Videiko 1994, 14 f.)

27 For dating Dereivka to the Tripolie C2 period see Rassamakin (2004a, 192, with references).

28 Mikhajlovka II provided a fragment of a hammer-axe and a stone pickaxe was found in a grave at Konstantinovka, while graves at Kamenka Dneprovskaja and Kichkas contained stone hammers (Korobkova and Shaposhnikova 2005, Fig. 58, 3; Rassamakin 2004b, 160, Pl. 482; Rassamakin 2004d).

29 Palaguta (1998) argues that the jars with pointed bottoms of the late-fifth-millennium BC "Cucuteni C ware" in the forest-steppe region were coil-built and subsequently shaped by beating. This specific, shell-tempered ware originates in the steppe areas of southern Ukraine and was initially imported and later locally manufactured by the communities of the early and mid-Tripolie periods (see Tsvek and Rassamakin 2002, 236–238).

30 Its origin is not related to the eastward expansion of the southeast European ceramic tradition, which is based principally on coiling or slab-building of flat-bottomed vessels (see also Chapter 3).

31 Further deposits are situated on the middle Dnepr at Orekhovo-Pavlograd (Klochko 1994, 143, 151).

32 Both Verkhnaja Maevka and Konstantinovskoe are situated outside the coastal zone.

33 Equipment for preparation of ores, smelting of copper, casting of axe pre-forms and finishing of axes. According to Černych (2003, 46), the volumes of the crucibles and moulds are matched.

34 Cf. tools for hammering, e.g. hammer-stones and anvil at Verkhnaja Maevka 2/10 (Rassamakin 2004b, Pl. 91, 2.3).

35 Not unlike the copper-working industry of the fifth millennium BC (see Černych 2003, 34).

36 Most often in graves with extended skeletons. Novopilippovka/Akkermen 13/7 (small spirals of copper wire; Rassamakin 2004b, 14, Pl. 32, 5), Vishnevatoe 2/2 (small copper spirals; Rassamakin 2004b, 10, Pl. 20, 3), Osokorovka 7 (a very small piece of wire; Rassamakin 2004b, 53, Pl. 165, 3), Kamenka Dneprovskaja 14/2 (a small copper spiral; Rassamakin 2004b, 17, Pl. 43, 2), Ljubimovka Kurgan group I, 3/1 (Rassamakin 2004b, 18, Pl. 44, 4), Skadovsk 1/6 (a copper spiral; Rassamakin 2004b, 120, Pl. 374, 3, 6).

37 Rolled tubular beads of sheet were found at Ljubimovka I 3/1 (Rassamakin 2004b 18, Pl. 44, 7), Kamenka Dneprovskaja 8/12 (Rassamakin 2004b, Pl. 455, 2), and Obloi 2/24 (Rassamakin 2004b, 101, Pl. 329, 3); rolled applications were at Novovorontsovka 1/8 (small pieces of sheet copper; Rassamakin 2004b, 53, Pl. 163, 2). Remains of leather were observed at Orekhov-Tarasova Mogila Grave 6 (a child's grave with 44 copper applications attached to a leather pectoral, belt and bracelet; Rassamakin 2004b, 11, Pl. 23). All objects have parallels in the region of the Dnepr rapids and Samara (Rassamakin 2004a, Fig. 56a).

38 Novopilippovka 13/7 (Rassamakin 2004b, 14, Pl. 32, 5).

39 Especially on the mid-Dnepr in cemeteries of the Sofievka group (see Dergachev and Manzura 1991).

40 A flat axe from Rostov-Vertoletnoe pole 1/7 is probably a Caucasian import (Zhitnikov and Zherebilov 2005, Fig. 2, 4).

41 Notably, the axe from Dolinka did not contain arsenic (Korenevskij 1974, Appendix). Shaft-hole axes of unalloyed copper are not found in the north Caucasus (see Chapter 4). Another representative of the distinctive steppe type of shaf-hole axes is the stray find from Zvenigorodka west of Uman (Černych 2003, Fig. 2, 2). In contrast, the stray finds from Balaklava, Verkhnedneprovsk and Stajka, which are similar in shape to the Caucasian shaft-hole axes of the Maikop period, contain arsenic (Korenevskij 1974, 16, 21, Fig. 3, 5, Fig. 6, 6.15 and Appendix), and may be actual imports from the Caucasus.

42 Korobkova claims to have identified an area of metalworking at Mikhajlovka II. Next to the central group of houses she observed a concentration of eleven stone tools with characteristic use-wear. Evidence for melting in the form of crucibles, metal prills, moulds or slags was absent (Korobkova and Shaposhnikova 2005, 271–275).

43 Since the size and construction of this wooden structure are comparable to numerous wagons of the Jamnaja culture, Gej (2004, 187) agrees with its interpretation as a wagon box.

44 The kurgan is situated in the region of Bagaevskij (Rostov district) on the left bank of Manych, less than 100 km from the coast. Excavations were conducted by Bezpaly. The results are unpublished; a field report is kept in the archive of the Institute of Archaeology at the Russian Academy of Sciences in Moscow (see Gej 2004, 186).

45 Was the wagon re-invented as a mobile home? The largest third-millennium vehicle had a box with a length of c. 240 cm and width of 200 cm (Gej 2004, 182) and it has been often speculated that such large wagons functioned as dwellings; historical accounts seem to support this hypothesis (Gej 2004, 185). However, there is no conclusive archaeological evidence for the use of wagons as dwellings in the third millennium BC.

46 While the second layer at Mikhajlovka provided abundant evidence for house floors of beaten clay and hearth platforms, the construction principles of the dwellings to which they belonged remain obscure, possibly because none of them was destroyed by conflagration.

47 For a map of worldwide pit house distribution see Gilman (1987, Fig. 1). In her cross-cultural study Gilman (1987, 541) notes that, "In the case of pit structures, three conditions are always present: non-tropical climate during the season of pit structure use, minimally a biseasonal settlement pattern, and the reliance on stored food while the pit structure is inhabited".

48 Dhavalikar (1995) notes that in the state of Maharashtra in west India only the poor, who cannot afford long posts, live in pit structures.

49 See Gilman (1987, 542): "Researchers at the Underground Space Center at the University of Minnesota (1979) have found that heat loss by transmission was less in earth sheltered structures than in any of the above ground models tested. […] underground structures take advantage of constant soil temperature, in that less energy is required to maintain a stable temperature".

50 E.g. at Alexandrovka 1/11, Baratovka 1/17 (child grave) and several graves in kurgans near Ordzhonikidze (among them also graves of children). Only two figurines have been reported to the east of Dnepr, at Novoalexeevka 6/15 (child) and Zaozernoe (Rassamakin 2004c).

51 In Grave 6 at Orekhov-Tarasova mogila (Rassamakin 2004b, 11, Pl. 23) and Pervomaevka I 2/2 (Rassamakin 2004b, 16 f., Pl. 40). Stone slabs with human shapes became more popular during the third millennium BC (see Tsimidanov 2003).

52 Megalithic features appear in the region between the Danube and South Bug around the middle of the fourth millennium BC (see Teslenko 2007, 77 f.,

with references). Stone and wooden cists were excavated at Konstantinovka, Novovorontsovka, Stare Gorozhino, Zolotaja Balka, Ljubimovka 14/7, and Dolinka (Rassamakin 2004a, Fig. 22, 5, Fig. 33; 2004b, Pl. 382; Kolotukhin 2008).

53 Rassamakin (1999) views monumental stone constructions as the result of contacts with the farming communities of the forest-steppe zone.

54 "The monumental tomb was the surrogate for the living village" (Sherratt 1990, 149).

55 Chemical characterization of ochre and cinnabar is possible (see e.g. Popelka-Filcoff et al. 2008) but has not yet been applied to finds from the north Black Sea littoral. The red pigment from the excavations of Veselovskij at Tsarskaja in the north Caucasus was cinnabar, which probably originated from Donbass (Alexandrovskaja et al. 2000).

56 Strings of such bone beads were worn around the waist or hanging on the sides; finds in situ have been reported from Vishnevatoe 2/2 (Rassamakin 2004b, 10, 139), Novoandreevka 4/2, Vinogradnoe 2/3 (waist and shoulder) and 3/41 (tights) (Rassamakin 1987, Fig. 1, 7.9), and Tankovoe 9/15 (35 beads around the skull and above the shoulder, Shchepinskij and Cherepanova 1969, 199, Fig. 75).

57 Imported painted pottery includes three sherds of large Late Tripolie painted amphorae found in House 8 at Mikhajlovka II (Korobkova and Shaposhnikova 2005, 64) and single vessels from Ljubimovka 23/4, Velikaja Alexandrovka 1/23 and Vishnevatoe 2/4 (see Fig. 6.18), and Ordzhonikidze "Zvadskie mogily" 9/10 (Rassamakin 2004a, Fig. 101, 3).

58 Imported pottery from the Caucasus in the coastal area of the north Black Sea includes a small spherical jar (h. 12,5 cm) with a short collar, red-yellowish colour, and burnished surface from Kurgan 1 at Sokolovka (Rassamakin 2004b, 178, Pl. 521); a pottery fragment from Mikhajlovka I (Nechitajlo 1984, 127 f.); grey and red polished and well-fired jars from Kojsug 5/18 and 5/24 in the Don delta (Maksimenko 1973). Moreover, several copper objects may represent north Caucasian imports: a chance find of a tanged dagger with two ribs from Novaja Kakhovka on the lower Dnepr, comparable to finds in the central Caucasus (Nechitajlo 1991, 38, Fig. 10, 1), a chance find of a shaft-hole axe from Balaklava comparable in shape to the Caucasian axes of the Maikop period (Korenevskij 1974, 16, Fig. 3, 5), and a poker-butt spearhead from a grave at Zamozhnoe near the Azov coast (Telegin 1973, 128). Another possible import from the north Caucasus is a dagger from Bulakhovka 3/9 in the valley of Samara, which apparently contained nickel (although, according to Nechitajlo, the shape of this artefact is not characteristic of the north Caucasus) (Nechitajlo 1991, 38 f.; Rassamakin 2004a, 72, with references). Silver and gold ornaments have been reported only for the region of the lower Don, e.g. a gold ring at Koldyri (Rassamakin 2002a, 51).

59 Features like large square pits (e.g. Pavlograd I 8/3; Rassamakin 2004a, Fig. 48, 10) and a skeleton in a contracted position on the right side with hands in front of the face relate these graves with the north Caucasus. For imports from the north Caucasus and the Tripolie area see Rassamakin (1999, 92–97); for "crooked" pins see Rassamakin (2001).

60 Hearth stands were found in Layer 6 of Razdorskoe (Kijashko 1994, Fig. 7, 11) and at Konstantinovskoe (Kijashko 1994, Fig. 23, 6–8).

61 Donskoe 1/9, Simferopolskoe vodokhranilishte 6/6, the settlement Site 4 at the Simferopol reservoir (Ivanova et al. 2005, 144), Chistenkoe 1/11 (Koltukhov and Toshchev 1998, 48 f., Fig. 24, 9), Beloe 3/13 (Toshchev 1998, 37, Fig. 18, 10), Uglovoe (Koltukhov and Vdovichenko 1997, 18, Fig. 12, 5), and Natashino 13/4 (Kolotukhin and Toshchev 2000, 200, Fig. 135, 7).

6. WETLANDS OF THE WESTERN BLACK SEA

1 The earliest fieldwork was conducted at Sukleja, Parkany, Krasnogorka, and Ternovka in 1896–1900 (see Zbenovich 1974, 4) and at Odesskij kurgan in 1912–1913 (Zbenovich and Leskov 1969).

2 The results of the excavations at Usatovo until 1973 are summarized in Patokova (1979) and Patokova et al. (1989). The excavations of Petrenko have not been published yet.

3 The results of these campaigns are not published.

4 Sites in the valleys of Prut and Siret, e.g. Folteşti-type settlement sites and kurgans with late Tripolie elements in their pottery (especially elements from the Gorodsk-Kasperovtsy group in the Dnepr-Bug interfluve) are considered by some authors to be part of the Usatovo group, though most researchers prefer to assign them to a separate group (see Manzura 1990, 183; Patokova et al. 1989, 83 f.).

5 Further excavations include fieldwork at Trapovka in 1974 (see Vanchugov et al. 1992, 5), rescue excavations of the Lower Dnestr Expedition of the Institute of Archaeology in Kiev in 1976 at a kurgan near Jasski (Petrenko and Alexeeva 1994), and rescue fieldwork conducted by Suvorovskaja Expedition near Purkary in 1978 (Jarovoj 1990).

6 Furthermore, in 1969, the University of Odessa excavated at Koshary near Lake Tiligul a kurgan (Kurgan 3) which was dated by the excavators to the Usatovo period (Gudkova 1980). However, Ivanova et al. (2005, 107) expressed justified doubts in this dating and suggested that it belongs to an earlier period.

7 Draganov reports that several Cernavoda III sites were identified during surveys along the coast of Dobrudzha in Romania (Draganov 1990, 161).

8 Excavations of a single kurgan built over the fifth-millennium BC settlement mound of Brailiţa in 1955 recovered a grave (Grave 20) with a skeleton in flexed position on the side, accompanied by typical Usatovo artefacts: a painted amphora with a lid, red pigment, 156 white and black cylindrical beads, and 3 bone objects (Harţuchi and Dragomir 1957, 141 f.). This grave is the westernmost point in the distribution of such artefacts.

9 For different meanings of the term "late Tripolie" in the literature see the summary in Dergachev and Manzura (1991, 5 f.). Some researchers use the name "late Tripolie" for Phase C1 and regard later groups as separate cultures independent from the Tripolie sequence. A more widely accepted opinion, which is adopted in this study, is the use of the term "late Tripolie" for the latest (C2) phase of Tripolie (while Tripolie C1 and the related Tripolie B2 phases are termed "middle Tripolie").

10 A gazetteer of excavated sites was published by Dergachev and Manzura in 1991.

11 However, there are also contradicting opinions, e.g. Roman (2001, 350) rejects the migration hypothesis.

12 Two conference volumes about the Baden culture (Chropovský 1973; Roman and Diamandi 2001) touch upon one of the major issues related to the finds at Cernavoda III – the relations between the lower Danube, the Carpathian basin and the Aegean.

13 Nikolova, e.g. considers this type of pottery a successor of the Hotnitsa-Vodopada–type material (Nikolova 2001, 249; 2008).

14 This group of sites is called by different researchers somewhat inconsistently Utkonosovka, Khadzider, or "Bessarabian variant of Cernavoda I". It includes e.g. Khadzhider 6/1, Novokotovsk, Ternovka 2/16, Kurgan 9 at Krasnoe, Kurgan 18 at Taraklia, and Nikolskoe (Petrenko 1991; Manzura 1990, 184 f.). A painted vessel was recovered in the central grave of Kurgan 6 at Khadzhider I (Patokova et al. 1989, 123 f.).

15 Stratigraphic superposition of Usatovo graves has been reported e.g. for Butory and Kurgan 1 at Kholmskoe (Chernjakov et al. 1986, 92; Alexeeva 1992, 56).

16 Previously, the dating of Usatovo hinged on typological comparisons of the long daggers from the kurgans at Usatovo with mid-third-millennium BC daggers in Anatolia and the Aegean (see Passek 1949, 208–210). This correlation, however, clearly contradicts the ^{14}C dates.

17 See Zbenovich (1971, 200) about this date, a measurement of a charcoal sample from a hearth in the ditch.

18 KIGN-281(4475±130 BP) and KIGN-282 (4580±120 BP), charcoal samples from the excavations of Petrenko in 1986 (Videiko and Petrenko 2003, 119), and Ki-9527 (4380±70 BP), a charcoal sample from Ditch 4 (Feature 1/1990) (Petrenko and Kovaljukh 2003, 106).

19 A sample of human bone from Grave 3/6 at Koshary III (Ki-11211) provided a date of 4720±80 BP, or 3690–3369 cal. BC. However, a pottery sherd and a long flint blade from this grave relate it to the middle Tripolie (B2-C1) rather than the late Tripolie period and thus to the first half of the fourth millennium BC (see Ivanova et al. 2005, 107). Samples of human bone and charcoal from Sadovoe 1/29 and Katarzhyno I 1/10 dated by the laboratory at Kiev yielded unexpectedly early values but finds from the grave at Katarzhyno allow a dating to the period preceding Usatovo, while the grave at Sadovoe 1/29 contained no datable artefacts (see Ivanova et al. 2005, 109).

20 There were also middle-sized cemeteries, e.g. Zhovtij Jar, which included 13 kurgans with 15 graves (Subbotin and Petrenko 1994). At Purkary were excavated 4 kurgans with 11 graves (Jarovoj 1990, 213 f.).

21 Surface finds and habitation remains were identified at Slobodzea, Palanka and Gradenitsy on the lower Dnestr (Zbenovich 1974, 6). Majaki and Usatovo-Boljshoj Kujalnik remain the only excavated habitation sites of this period.

22 The archaeological site has been destroyed by a limestone quarry.

23 About 16% of the skeletons were lying on the back in a flexed position, 8% were placed in a flexed position on the right side, and only 3% were in an extended supine position (Patokova et al. 1989, 94–96). Flexed on the back were, e.g. the skeletons in eight graves in kurgans at Usatovo (Patokova 1979, 90), the skeletons at Katarzhyno 1/10 and 2/1 (Ivanova et al. 2005, 107, Fig. 23, 3 and Fig. 28, 2), Grave 1 in the kurgan at Tudorovo (Meljukova 1962), and Graves 4 and 5 at Jasski (Petrenko and Alexeeva 1994). For "extended" skeletons see e.g. Agulnikov and Savva (2004, 207; Nikolskoe 8/7), Vanchugov et al. (1992, 25; Kochkovatoe 30/2) and Zbenovich (1974, 41; Kurgan 91 and 147 at Parkany). However, since such graves generally do not contain artefacts, their association with the Usatovo group is based solely on stratigraphic observations.

24 Tudorovo (Meljukova 1962), Purkary (Jarovoj 1990, 214), Jasski (Petrenko and Alexeeva 1994), Ogorodnoe 1/16 (Subbotin et al. 1970, 135), and Majaki (Patokova et al. 1989, 54).

25 Larger kurgans are rare exceptions. The highest tumulus at Usatovo (Kurgan 11 in Usatovo I) was 2,1 m high and had a diameter of 40 m (Patokova 1979, 61 f.). The kurgan at Alexandrovka, probably the most imposing mound of the Usatovo period, had a diameter of 35 m (Petrenko and Kovaljukh 2003, 104); the massive stone circle surrounding Grave 21 in Kurgan 1 at Purkary had a diametre of 40 m (see Jarovoj 1990, Fig. 17).

26 Stone rings of standing slabs like those at Katarzhyno 2/1, Kurgan 6 at Jasski (Ivanova et al. 2005, 42, 106, Fig. 28), and Kurgan 90 at Parkany (Dergachev and Manzura 1991, 67, Fig. 45, 10) are rare exceptions.

27 These flat graves closely resemble graves of the cemetery at Vykhvatintsy on the Middle Dnestr (Zbenovich 1974, 50 f.).

28 Barrows usually contain one to three graves (Usatovo, Purkary), sometimes five (Sadovoe). In Jasski, as an exception, two adults and nine children were buried in a single tumulus (Petrenko and Alexeeva 1994).

29 A further example is a 45 cm deep pit under Kurgan 1 at Majaki, containing charcoal and pottery sherds (Patokova et al. 1989, 54).

30 E.g. Grave 33 at Sadovoe (Maljukevich and Petrenko 1993), Grave 35 at Alexandrovka (Petrenko and Kovaljukh 2003), and Purkary 2/13 (Jarovoj 1990, 98, 215).

31 The cemeteries are roughly contemporaneous; see Zbenovich (1974, 132).

32 The kurgan at Alexandrovka, excavated by Petrenko in 1993, belongs to the largest constructions of the fourth millennium BC and is closely comparable in scale and features to Usatovo I-11. Grave 35, the central grave of this kurgan, was covered with a 2 m high stone heap and contained the remains of a male individual, pottery vessels, silver spiral rings, an antler hammer, microlith sickle inserts, hammer stones, sheep bones placed on a wooden plate, and copper tools (knife, shafthole axe, two flat axes, a chisel, and two awls). Finds from Grave 34, a secondary grave of a child, include a head cover with beadwork of paste beads, a necklace of black agate and white coral beads, strings of stag teeth on the ankles, a clay human figurine, and silver rings (Petrenko and Kovaljukh 2003; Videiko and Burdo 2004b, 389 f.).

33 Manzura (2005b, 52) dates Grave 1126 to the third-millennium BC Jamnaja culture.

34 According to Zbenovich (1974, 114) cultivation of heavy steppe chernozems is not possible without advanced mechanical tools for breaking the soil cover; cultivation of lighter soils was probably the rule, while the steppe chernozem was used for grazing.

35 Archaeobotanical evidence from Cernavoda III–type sites is very scarce. Antler hoes and saddle querns found at the site of Dealul Sofia suggest the cultivation of grain crops (Roman 2001, 15; Berciu et al. 1959, 99–103; Morintz and Roman 1968, 92). Imprints of millet seeds were identified in burned daub at the settlement near Dragantsi (Gergova et al. 2010, 122)

36 The identification of grain imprints of free-threshing hexaploid wheat (bread wheat, *Tr. aestivo-compactum*) at Majaki and Purkary (Patokova et al. 1989, 118; Jarovoj 1990, 259) should be treated with caution, since grain shapes overlap with the tetraploid variety and only rachis internodes provide secure evidence for hexaploid wheat (see Zohary and Hopf 2000, 52 f.; van Zeist 2003, 550; van Zeist 1999, 360).

37 Oats (*Avena sp.*) was possibly a weed and was not cultivated for food.

38 Spelt and hulled barley were absent. In comparison, the cultivars in the forest-steppe zone were also dominated by hulled wheats (emmer), but the hulled variety of barley was more common and millet was comparatively rare (Janushevich 1978, 61, Table 1 and 2; Janushevich 1984, 267; Nikolova and Pashkevich 2003, 89).

39 According to the number of imprints, broomcorn millet predominated significantly among the cereals.

40 For the origin and spread of broomcorn millet see Hunt et al. (2008), Motuzaite-Matuzeviciute et al. (2009), Crawford (2009), Lu et al. (2009) and Frachetti et al. (2010). The earliest evidence of cultivation of millet comes from northeastern China in the eighth millennium BC, but evidence is more abundant from the sixth millennium BC onwards. Millet spread to central Europe (where it was not native) by the fifth millennium BC (Motuzaite-Matuzeviciute et al. 2009 with references). See also *The East-West Millet Project:* http://www.arch.cam.ac.uk/millet/.

41 Impressions of hemp seeds may have also been identified at neolithic (late-sixth-millennium BC) sites in Moldova and Ukraine (e.g. at Dancheny 1;

Pashkevich 2003, 289, Fig. 18.1 and Fig. 18.2; Larina 1999, 89). Hemp (*Cannabis sativa*) is a short-day plant native to Central and East Asia. It has been suggested that the earliest evidence for the use of hemp fibres is provided by impressions of cord on neolithic pots in northern China and dates to the fifth or early fourth millennium BC (flax and cotton were not cultivated in China in this period, but it cannot be excluded that the cord was produced from the fibres of another plant, such as nettle) (Barber 1991, 17; Fleming and Clarke 1998).

42 Other late Tripolie groups provided more numerous examples of this tool in larger sizes and various shapes (Patokova et al. 1989, 119).

43 A different type of sickle, consisting of a large, 16–17 cm long blade with retouch on the edge, was characteristic for late Tripolie groups in the forest-steppe zone, e.g. at Trojanov, Sofievka, and Krasnyj khutor (see Bibikov 1962, Fig. 6, 1).

44 Seven pieces found in Grave 35 at Alexandrovka probably belonged to a similar tool (Petrenko et al. 1994, Fig. 2; Petrenko and Kovaljukh 2003, 106). Flint flakes with gloss found at the settlements of Majaki and Usatovo were interpreted as sickle inserts (Zbenovich 1971, 195; Petrenko et al. 1994; Sapozhnikova and Sapozhnikov 1991).

45 For the earliest direct chemical evidence of milking in the Old World, dating to the seventh and sixth millennia BC see Evershed et al. (2008), Craig et al. (2005) and Dudd and Evershed (1998). The study of Evershed et al. (2008) of 2.200 pottery sherds from 23 sites in Anatolia showed that milking ruminant animals was widespread during the seventh to fifth millennia BC. For identification of milk on sherds dating to the Baden-Boleráz period (second half of the fourth millennium BC) see Craig et al. (2004), for fourth-millennium sites at Lac de Chalain and in Britain see Regert et al. (1999) and Copley et al. (2003).

46 In comparison to other species of wild animals, the number of horses at this site was strikingly high (Patokova 1979, 146, Table 4), but a high proportion of horse bones is not a sufficient proof for the presence of domestic horses. In contrast, Majaki provided large numbers of bones of ass (*Equus hydruntinus*, Zbenovich 1971, Table 2, 1974, 115).

47 However, since in Usatovo no differentiation between aurochs and domestic cattle has been made, the numbers of wild animals might be actually higher (Patokova et al. 1989, 122).

48 Two types of flint arrowheads (Patokova 1979, 22, Fig. 7) attest to the use of active hunting techniques.

49 An interesting comparison offer the settlements of the early Greek settlers in the Black Sea. The major early Greek colonies (e.g. Tyras, Niconia, and Olbia) specialized in fish processing and trade. Strikingly, they did not occupy sites suitable to exploit the flows of pelagic migratory fish – like the prehistoric sites, the Greek settlements were situated near the shallow limans and river mouths and apparently relied on river fish (see Ascherson 1995, 50 f.)

50 Cernavoda III–Dealul Sofia provided evidence for a comparable exploitation of wild resources. About 20% of the bones belonged to wild animals, mainly red deer and roe deer, horses, aurochs, and wild boars. Aquatic species included freshwater fish like carp, pike, and big catfish, and the molluscs *Unio* and *Cardium* (Susi 2001).

51 Transhumant pastoralism in the prehistoric and early historical periods is a hotly debated topic in zooarchaeology (see Clason 1998; Moreno García 1999; Arnold and Greenfield 2006; Valamoti 2007). Moreno García (1999, 172) argues that not the environmental conditions but the number of animals determines the necessity for seasonal movement between pastures in two complementary environmental zones. The seasonal movement of animals is necessitated by the high costs of stall-feeding and housing during the winter period. Without the practice of intensive milking and milk processing, however, most animals in subsistence farming are culled before or around the age of full growth. The building of

large flocks with its corollaries winter stalling resp. seasonal movement appears unlikely and unnecessary before the introduction of intensive milk consumption and preservation (or meat production for the market).

52 Finds of spindle whorls have been reported from Kurgan 147 at Parkany 1 (a clay spindle whorl was found together with a skeleton in an extended position on the back, two vessels, a copper ring and a silver ring with a bead; Passek 1949, 206), from the settlement at Usatovo (biconical whorls; Patokova 1979, 42 f.), Grave 3 of Usatovo II-2 (one biconical clay whorl; Patokova 1979, 81, Fig. 32, 8) and from the ditches at Majaki (several biconical clay whorls; Zbenovich 1974, 33). Spindle whorls have also been found at Dealul Sofia (Roman 2001, Pl. 3, 4).

53 Trapezoid microlithic tools have been recovered from the ditch at Majaki (Zbenovich 1971, 195) and from graves at Usatovo, Majaki, Purkary and Alexandrovka (Zbenovich 1974, 60 f., Fig. 23, 30–38; Petrenko et al. 1994).

54 A further centre of flint mining of Tripolie C1 was situated, according to Tsvek and Movchan (2005), in the region of Kirovograd, east of the middle Bug.

55 Such regular blades with lengths of 15–20 cm were broken into segments and used as blanks for cutting tools and sickle inserts. This system of specialized long-blade production near the sources of high-quality flint and supply of a large area through exchange, resp. the specialized technology for removal of long regular blades, emerged in the Tripolie C1 phase (Tsvek and Movchan 2005, 66).

56 At Usatovo, 88% of the pottery belonged to the common ware with shell and sand admixtures, and 12% to the fine painted ware. In Majaki, fine painted ceramics were more rare: 85% of the sherds were from coarse dark-coloured pots, 10% were from fine dark-coloured vessels, and only 5% belonged to the black-on-buff painted ware (Zbenovich 1971). On the middle Dnestr, the portion of painted ware reached 50–70 per cent at some sites (Dergachev 1980, 61).

57 The use of cord in pottery ornamentation began in the Tripolie B2-C1 period, though it became widespread and sophisticated only during the late fourth millennium BC (Rassamakin 2002a, 50). A relation between the prominence of cord decoration and hemp cultivation has been suggested by Sherratt (1997a, 425). Rassamakin (1999, 151) notes the coincidence of cord ornaments with a rise in frequency of spindle whorls at sites of the Tripolie C1 and C2 periods.

58 See Gibson and Woods (1997, 236): "Proper reduction only occurs when the iron oxides are affected, usually over quite lengthy periods of time and at temperatures in excess of 850°C." This is not the case in open firing but only in a kiln: "It is not possible to produce completely reduced wares in an open firing, as the atmosphere fluctuates rapidly and constantly within the fire and cannot be controlled for any length of time."

59 The manufacturing of painted pottery in the region east of the Carpathians began during the Tripolie B period with trichrome (red, black and white) designs; in Tripolie C1, polychrome decoration was replaced by monochrome (black) painted designs. The tradition of painted pottery was introduced into the region east of the Carpathians, most probably from central Transylvania (the Petreşti group); see Ellis (1984, 61).

60 Noll et al. (1975) suggest that the use of this technique began in the Halaf period, or around 6000 BC; at this time, it was present in northern Syria, Anatolia, and the Aegean.

61 Evidence for the presence of mangan in the black paint of the ceramics in the eastern and northern regions of Tripolie has been provided by Ellis (1984, 120, with further references).

62 This technique apparently appeared later than iron reduction, possibly around c. 5000 BC. At this time it was in use in Iran (Cheshme Ali), Anatolia (Mersin), Thrace (Dikili Tash), Thessaly (Dimini), and Attica (Kitsos) (Noll et al. 1975, 609, Fig. 12).

63 At Bodeşti (Cucuteni A), Galvaneşti Vechi (Cucuteni B), Zhvanets-Shchovb (Tripolie C2). Ellis draws attention to the coincidence of the beginning of painted

pottery, fine clay bodies, and kiln firing in Cucuteni-Tripolie (Ellis 1984, 159). See also Ellis (1984, Fig. 8): x-ray diffraction analysis of the black paint showed the presence of the mineral hausmannite (Mn_3O_4), which is an indicator for a firing temperature exceeding 1000°C.

64 In an archaeological case described by Pool (2000), the potters of Sierra de los Tuxtlas, Veracruz, Mexico, practiced open firing for coarse vessels and firing in updraught kilns for fine painted pottery during the Classic period.

65 A typical set of vessels found in the graves consists of a jar/amphora as a serving food container, a painted bowl or cup as a serving vessel and one or several coarse storage/cooking vessels with corded decorations (e.g. Usatovo I-1/1, I-2/1, I-6, I-8/5, I-12/1, II-2/1; Patokova 1979).

66 See Dergachev (1980, 61, 126): in the middle and upper Dnestr valley, painted pottery was much more frequent (reaching 50–70% of the ceramic assemblages) during the early part of the period (Vykhvatintsy and Brynzeny group), but at later sites (e.g. Tsviklovtsy and Zvenjachin of the Gorodineşti group) it decreased to c. 7%. In Volyn (the Trojanov group), painted pottery accounts for c. 10% (Dergachev 1980, 126).

67 Sherratt (2003a, 417) explains painted designs as skeuomorphs of woven basketry decoration, while the loss of painting and the dominance of dark shining surfaces, channeling, and ribbon handles represent in his opinion an emulation of metal shapes. Thus, he regards the latter surfaces as an indication of the emergence of new prestige habits of serving and consumption.

68 A grave of the Usatovo period in the kurgan at Sadovoe also reportedly contained beads of white faience (Videiko and Burdo 2004b, 284 f.).

69 A grave in Kurgan 3 at Sukleia, excavated in 1896–1897, contained a silver spiral ring, a whetstone with a hole, two animal teeth, a copper dagger, a flint knife, a necklace of beads, and a piece of "glass slag" (Passek 1949, 206–208). Moreover, Ostroverkhov (1997, 71) has identified the blue pigment on the skull of a 40–50-year-old individual buried in Kurgan 8 of the second kurgan cemetery at Usatovo (unpublished results from the excavation season in 1984) as "Egyptian blue".

70 Microwear studies of flint artefacts attest to the use of a threshing sledge at sites of the Tripolie and Gumelniţa groups. E.g. analysis of microwear suggests the presence of inserts for threshing sledges at the Tripolie B2 site of Voroshilovka (Videiko and Burdo 2004a, 141) and at the late-fifth-millennium site Durankulak (Skakun 1994).

71 There are also miniature animal figurines with perforated legs (Videiko and Burdo 2004b, 194).

72 It seems unlikely that heavy two-axled wagons were pulled by single oxen, since the load pulled by an animal depends basically on its weight (see Spruytte 1983, 98–105).

73 Their absence in the graves is not an issue of preservation, since numerous wooden wagons from the Jamnaja period (the third millennium BC) were recovered in the same kurgan cemeteries and even in the same kurgans as graves of the late Tripolie (Usatovo) period (e.g. Majaki 5/5, Jasski 1/18 and 2/2, Kholmskoe; see Alexeeva 1992, 99 ff.). For clay models of wheels at late Tripolie sites, e.g. at Velikaja Slobodka on the middle Dnestr (a site of the Kasperovtsy-Gorodoneşti group) see Korvin-Piotrovskij and Movsha (1999, Fig. 1). However, nearly identical objects have been recovered from fifth-millennium BC Gumelniţa and Cucuteni A sites (Dinu 1981), and these wheels were most probably used as spindle whorls. At Arbon Bleche 3 near Lake Constance, an identical wheel was found on a wooden spindle with yarn (De Capitani and Leuzinger 1998, Pl. 3, 10).

74 The difference in chemical composition of copper artefacts from the middle and late Tripolie periods was interpreted by Chernykh (1970) as an indication for a shift of copper supply to new deposits in the second half of the fourth millennium BC.

Chernykh assumed that the prevalence of arsenical copper at Usatovo speaks for a Caucasian origin of the raw material (Chernykh 1970, 26).

75 Krassimir Leshtakov reports about copper ore and "slags" in a dwelling at Jabalkovo that dates to the first quarter of the sixth millennium BC (Karanovo I period) (Leshtakov 2004, 16). For copper beads and awls made of cold-worked native copper at sites dating to the late sixth millennium BC in Transsylvania, the Danube gorges, central Bosnia, and eastern Serbia see Borić (2009, note 1). For use of native copper and malachite at late-sixth-millennium sites in Bulgaria (at Usoe I and grave 626 at Durankulak) see Todorova and Vajsov (2001, 8) and Todorova (1999, 237). The earliest secure evidence for smelting provides a slag from Belovode, a site of the early Vinca period, dating to the middle of the sixth millennium BC (Borić 2009). Sub-surface extraction of copper in east Europe began, according to the evidence recovered in the eastern and central Balkans, in the middle of the fifth millennium BC (Ottaway 1994, 53–57, with references). The oldest large cast objects in southeast Europe were chisels and flat axes of pure copper, which appeared about 4700–4600 BC (see Todorova 1999, 237, Fig. 4). Cast artefacts became more frequent around 4500 BC. The first shaft-hole copper tools (hammer-axes) appeared around 4500–4300 BC; the oldest gold artefacts date to the same period (Ryndina 2003; Todorova 1999). The casting of axe-adzes and daggers began between 4300 and 3800 BC and was apparently associated with the introduction of arsenical copper. In the following period, c. 3800–3000 BC, short and wide flat axes were the predominating tool form (Todorova 1999, 1981).

76 Investigations of slags on crucibles from sites of the late Gumelniţa period attested to the process of co-smelting, the smelting of oxide copper ores together with sulphide ores (Ryndina and Ravich 1996, 121). See also Ryndina et al. (1999, 1066): "The analysis of the residues on the crucible from Dolnoslav given above allows us to believe that it is connected with the smelting of polymetallic sulphide ores mixed with malachite." The process need not be deliberate, since most copper ore deposits contain natural mixtures of oxides and sulphides (Craddock 1995, 285; Lechtman and Klein 1999, 499).

77 For finds of copper minerals at sites see also Ottaway (1994, 56).

78 For a comparison see Cushing 1894, cited in Tylecote and Merkel (1985, 4), about an experiment with a "hole-in-the-ground" furnace (a clay-lined pit, replica of a Pueblo furnace of AD 1300). Reducing roasted ore in charcoal fire with natural draught in this installation produced copper "buttons". However, since the site of Durankulak was situated in a region devoid of copper deposits, it seems plausible that the installation in House 4–10 was used for melting. Dimitrov (in Todorova 2002, 150) suggests that copper circulated and was imported to Durankulak in the form of metal rods.

79 The site of Stara Zagora "Okruzhna bolnitsa" (district hospital) is situated about 6 km from the famous Chalcolithic copper mines at Ay Bunar and dates to the third phase of the Karanovo V (Maritsa) period, or c. 4700–4600 BC.

80 Moreover, the slagged vessels from Dolnoslav and Chatalka in Thrace were heated to relatively low temperatures (c. 800°C). Ryndina et al. (1999, 1066) interpret them as receptacles for collecting molten metal flowing out of a smelting furnace (rather than smelting crucibles). An alternative explanation, however, is the use of these crucibles for smelting very high-grade copper oxide ores, which is possible at low temperatures; see Schoop (1995, 40, with references). A clay crucible with a slagged inner side has been recovered from House 18-V at Durankulak (Todorova 1999, Fig. 8).

81 The first artefacts of arsenical copper date to the transition from the fifth to the fourth millennium BC, e.g. the dagger from Gorodnitsa II with 1.35% arsenic (Ryndina 1998, 146 n. 25). This dagger was part of a hoard in a vessel recovered during excavations in 1895 at a settlement site of the Tripolie B2 period. It was associated with a type of axe-adze dating to the transition between the fifth

and fourth millennium BC (Videiko and Burdo 2004b, 126 f.). A chance find of a Jaszladany-type axe-adze with 1.8% arsenic from present-day Bulgaria dates to the same period (tools of this type were very common in the Carpathian basin during the Bodrogkeresztur period) (Todorova 1981). See also Chernykh (1978) for analyses of series of copper-base objects from Bulgaria: while the hammer-axes (Chernykh 1978, Table II.8), a tool dating to the second half of the fifth millennium, did not contain arsenic, 5 of the 38 axe-adzes (Chernykh 1978, Table II.7), typical for the first quarter of the fourth millennium BC contained some arsenic. In southeast Europe, arsenical copper became common only in the second quarter of the fourth millennium BC. For awls of arsenical copper from the Tripolie C1 sites of Taljanki and Chapaevka on the middle Dnepr see Ryndina (1998, 146). For objects of arsenical copper from the second quarter of the fourth millennium in the east Balkans (e.g. daggers and flat axes) see Vajsov (1993) and Todorova (1981). For artefacts from Ilıpınar IV in west Anatolia see Begemann et al. (1994).

82 Chemical analyses were conducted on objects from Purkary, Tudorovo, Usatovo, and Majaki (Kamenskij 1990; Konkova 1979; Meljukova 1962; Zbenovich 1974, Table 5), and Durankulak (Todorova 2002, 160).

83 0.6% and 0.12% respectively (see Patokova 1979, table on p. 162, nos. 5 and 12).

84 One further object of copper with arsenic and nickel has been reported from the site of Veremie on the middle Dnepr, a settlement dating to the Tripolie B1-B2 period (4200–3800 BC) (Ryndina 1970, 21 f., Fig. 1, 3, with references; 1998, 140). The shape of this object is certainly foreign to southeast Europe and has close comparisons in the Caucasus (e.g. the pickaxes from Lechinkaj and Pjatigorsk, the Erevan hoard and Sé Girdan; see Chapter 4; Martirosjan and Mnatsakanjan 1973, Fig. 47; Muscarella 2003, Fig. 5); thus, it almost certainly represents an import. The artefact was recovered during excavations in the late nineteenth century.

85 Melting and casting of copper were mastered during the Tripolie B1/B2 period (at the transition between the fifth and fourth millenniums BC), as indicated by finds of cast ingots from Iablona I and Nezvisko (Dergachev 2002a, 80; Ryndina 1961, 206 f.). In the eastern Balkans casting began earlier, around the middle of the fifth millennium BC (Todorova 1999).

86 Possibly in closed two-partite clay moulds like those found at sites of the Tripolie C1 period (Ryndina 1998, 139; Passek 1949, 188; Videiko and Burdo 2004b, 247).

87 Also a traditional technique which was first used in the fifth millennium BC (see Ryndina 1998, 79, Table 24; Kienlin and Pernicka 2009, 270).

88 For the criteria for distinguishing between hot-working and cold-working with annealing see Scott (1991, 7) and Ryndina (1998, 17–20). Shaping by hot-working in Balkan metallurgy began together with smelting and casting in the fifth millennium BC (Ryndina 1998, 93; Ryndina and Ravich 1996, 118). Cold-hammering was generally not used for shaping but only for hardening the work edges.

89 According to Ryndina (1998, 188) hot-working at 300–500°C was still practiced at sites of the third millennium BC in the Balkans, e.g. at Bereketska (despite being unsuited for arsenical copper – the object from Bereketska had cracks). The appropriate technological sequence for working arsenical copper (casting, a cycle of cold-hammering and annealing for shaping, and final cold-hammering of certain parts for hardening) is attested in the north Caucasus and in the Carpathian basin from the second quarter of the fourth millennium BC onwards (Rydina et al. 2008, 208 f.; Kienlin and Pernicka 2009, 265; see also Chapter 4).

90 Six objects from Purkary and some daggers and axes from Usatovo had cold-hammered working edges. All awls from Usatovo, the axes from Usatovo I-3 and II-3, and the chisels from Usatovo I-12 and I-13 were manufactured in the same operational sequence but without a final stage of cold-working (Konkova 1979, 176). A similar operational sequence (typically without final cold-working) was used in the Carpathian basin during the first quarter of the fourth millennium BC (see Kienlin and Pernicka 2009, 265 f.).

91 These basic techniques first appeared during the Tripolie B period in the late fifth millennium BC (Ryndina 1961, 206).

92 Another possible method for inducing surface enrichment is the intentional placing of the objects in wet sand mixed with table salt, as demonstrated experimentally by Ryndina (2005, 125).

93 A simple silver ring with a stone bead was found in a grave in Kurgan 147 at Parkany (Passek 1949, Fig. 98, 14; Dergachev and Manzura 1991, 66 ff., Fig. 46, 11); a single spiral silver ring in Kurgan 3 at Sukleia and at Purkary 2/7 (Passek 1949, Fig. 99, 8; Jarovoj 1990, 92, 217, Fig. 41, 3) and pairs of spiral rings at Purkary 1/21 and Alexandrovka Grave 35 and 34 (Dergachev and Manzura 1991, 71, Fig. 47, 11; Jarovoj 1990, 62 ff., 217, Fig. 27, 3; Petrenko and Kovaljukh 2003; Videiko and Burdo 2004b, 390). Altogether 15 silver spirals and rings were found at Usatovo (Zbenovich 1974, 74; Patokova 1976, 57): 11 spiral rings in Usatovo I-13, single silver rings in Usatovo I-6 and I-11, and a pair of rings in I-12. The silver wire found at Usatovo was produced of metal stripes by hammering (Konkova 1979, 175).

94 Analyses of five silver rings from Usatovo conducted by Konkova (1979) revealed that three of the analysed artefacts did not contain lead; two objects contained traces of lead in quantities of 0.13% and 0.15%, which was higher in comparison to copper objects. Craddock (1995, 213) suggests that lead contents below 0.05% indicate that the metal was not cupelled (obtained from argentiferous lead ores by the process of cupellation; see Chapter 4). Thus, at least three of the analysed objects from Usatovo were made of native silver. The two remaining rings with low lead content do not necessarily attest the practice of cupellation since, as Craddock pointed out, native silver can also contain lead in concentrations more than 0.5%.

95 One further silver crescent pendant originates from a fourth-millennium grave at Kovalevka VII (Ustinova mogila, Grave 32) on the southern Bug, but the exact dating of this grave remains uncertain (Rassamakin 2004b, 130 f., Pl. 415, 2). A spiral ring of copper-silver alloy containing 35% silver has been recovered from Terny 9/2 in the valley of Samara, in a grave with an extended skeleton. According to Ryndina, this find dates to the Tripolie C1 period or the earlier fourth millennium BC, while Rassamakin suggests a Tripolie C2-date (Rassamakin 2004b, 36, Pl. 103, 3; see also Rassamakin 2004a, 148 f.).

96 Among the late Tripolie groups, only Usatovo and Sofievka provided larger assemblages of metal artefacts.

97 Researchers believe that this tool originated in the north Caucasus (see Zbenovich 1974, 75).

98 The disappearance of shaft-hole tools is a general trend in the metalworking of southeast Europe in the course of the fourth millennium BC (see Kienlin and Pernicka 2009, 270). North Caucasian–type shaft-hole axes of are absent among the finds from the northwest Black Sea littoral. Grave 35 at Alexandrovka (Videiko and Burdo 2004b, 390) yielded a shaft-hole axe with a peculiar form that might have developed outside the Caucasus.

99 E.g. a dagger from Gorodnitsa II, made of arsenical copper. The dagger was found during excavation in 1895 and was part of a hoard deposited in a painted vessel, together with a Jaszladany-type axe, dating to the turn of the fifth to the fourth millennium BC, or the Tripolie B2 period (Videiko and Burdo 2004b, 126 f., with references).

100 E.g. Mondsee-type daggers and related types with a three-sided base and rivets dating to 3800–3500 BC (for finds from the Carpathian basin and the Alpine foreland see Matuschik 1998, 213–238, and for finds from Hotnitsa-Vodopada and Haramijska dupka in the Balkans see Vajsov 1993). For comparable daggers from the cemetery at Ilıpınar near Lake Iznik in west Anatolia, dating to the second quarter of the fourth millennium BC, see Roodenberg and Alpaslan-Roodenberg (2008).

101 For the metal inventory of other Late Tripolie groups on the middle and upper Dnestr see Klochko (1994, 150) (for the Tsviklovtsy hoard containing artefacts of "pure" and arsenical copper see also Videiko and Burdo 2004b, 587); see Dergachev and Manzura (1991) for metal finds at cemeteries of the Sofievka group on the middle Dnepr.

102 For a detailed discussion of the designs see Zbenovich (1974, 93 f.).

103 Human figurines have been found at Majaki, Usatovo, Alexandrovka and Ternovka 2 (Zbenovich 1971; Patokova 1979; Agulnikov and Savva 2004, 199 ff.; Videiko and Burdo 2004b, 390). Most figurines have been recovered in the graves of infants and children (at Majaki in Grave 3/2, 5/2, and "Complex V"/12, 8/7; at the flat cemetery of Usatovo in Graves 2/5 and 5/5; in Alexandrovka Grave 34; see Patokova et al. 1989, 1979; Videiko and Burdo 2004a, 390). Figurines were also deposited in "cult pits" (e.g. in connection with a child's grave in Kurgan I-2 and in the flat cemetery of Usatovo; Patokova 1979, 106, 140). In Vykhvatintsy on the middle Dnestr, too, six out of seven figurines (in one case a rattle) were found in graves of children and infants (see Dergachev and Manzura 1991).

104 Head injuries have been reported for several graves of predominantly male individuals at Majaki and Usatovo. A male and a female buried together in Majaki III/5 were apparently killed by blows with a stone hammer (Patokova et al. 1989, 80); an adult male from Majaki 5/2 suffered numerous head injuries (Zinkovskij and Petrenko 1987). An old male buried in Usatovo 9/2 had two skull injuries with traces of inflammation; another 80-year-old male from Usatovo 3/3 had suffered at least three skull injuries caused possibly by blows with a hammer-axe. Skull fractures were also frequent in the kurgan cemeteries of Usatovo: an adult male from II-5/2 showed a healed skull injury; a young male from II-5/2 suffered a strike with a hammer-axe; and an adult male from II-9/2 had a large skull fracture (Zinkovskij and Petrenko 1987).

105 About performance as an aspect of feasting see Mills (2007).

106 The construction of Kurgan 1 required considerable labour; it occupied a central position in the cemetery and covered the only grave with a wooden cover at the site. The grave contained the skeleton of an adult male who possibly suffered a violent death (Patokova et al. 1989, 52 f.). Since the grave was not intact, robbers have probably removed the artefacts accompanying the deceased person.

107 Elements that do not derive from the Tripolie tradition are very few, e.g. the kurgan as a burial monument and some pottery features (bowls with S-profiles and the white filling of impressed ornaments, e.g. were unfamiliar to the forest-steppe potters; see Dergachev 1980, 106–107; Zbenovich 1974, 103, with regards to these latter features as influences from the lower Danube).

108 A shell admixture in the clay body is not an indication for a "steppe" influence, since shell was integrated into the ceramic tradition of Tripolie already in Phase B1-B2 (cf. Tsvek and Rassamakin 2002, 233). Shell was the main opening material used by potters of all late Tripolie groups (see Dergachev 1980, 55 n. **).

109 The piece of stibnite, an antimony ore used as black eye makeup, has been recovered during excavations in 1921 (Patokova 1979, 151). Sources of stibnite are situated in Thrace and in the Carpathians (Videiko and Burdo 2004a, 216).

110 Even in the assemblages of the Folteşti group in the region between Prut and the Carpathians, which are closely related to Usatovo and have a good geographic connection to the Danube corridor, evidence for similarities with Cernavoda III is extremely scarce (Manzura 2001).

111 For Tripolie see Ryndina (1998), for west Anatolia see Roodenberg and Alpaslan-Roodenberg (2008), and for central Europe see Strahm (2010). In contrast, the third millennium BC (Jamnaja period) witnessed the wide spread of Caucasian types of tools.

112 Nikolova (2008) attempted to correlate pottery from the cemetery of İlıpınar IV near Lake Iznik with Hotnitsa Vodopada in the valley of Jantra in north

Bulgaria. Both sites have been dated by means of ^{14}C to the second quarter of the fourth millennium BC and thus precede the Cernavoda III-Boleráz period by several centuries. The ceramic material reviewed by Nikolova, however, does not really show any close similarities.

7. UNKNOWN COASTS: THE BLACK SEA LITTORAL OF ANATOLIA

1 For the excavations at the mid-third-millennium BC inland habitation site in the cave of Yassıkaya near Ereğli see Efe (2004) and Efe and Mercan (2002).

2 Dönmez (2001, 304) also dates the lowest levels of Kocagöz to the Chalcolithic period. Two rescue excavations at prehistoric sites have taken place inside the city of Sinop: at a third-millennium BC tumulus on the slope of Boztepe in the 1970s (Doonan 2004, 10, with references) and at a pre-colonial settlement at the port of Sinop in 2000 (Doonan 2004, 10, 56 f.).

3 Burney surveyed the area in 1955 (Burney 1956) and Işın from the Archaeological Museum of Sinop conducted extensive fieldwalking in 1987–1990 (Işın 1998). In 1997–1998, Dönmez surveyed the vicinity of Erfelek and Gerze (Dönmez 2001).

4 See e.g. the Pylos Regional Archaeological Project (Davis et al. 1997) and the Keos survey (Cherry et al. 1991).

5 The site was visited by Burney in 1955, Işın in 1987, Dönmez in 1997 and Doonan in 1998–1999.

6 Comparable fine pottery with burnished beige, grey and black surfaces has been reported from several other sites, e.g. İlyan'nın Yeri (Işın 1998, 99 f., Pl. 7) and Çimbek Tepe (Işın 1998, 100, Pl. 8, Pl. 9).

7 Bauer (2006, 190) compares it, most probably incorrectly, to the "face pots" from Troy.

8 One trench on the slope yielded layers dating to the third millennium BC.

9 Excavations were directed by Alkım from 1974 until his death in 1980; since 1981, the expedition at İkiztepe has been led by Bilgi. The results of the first six campaigns have appeared in two large volumes (Alkım et al. 1988, 2003); for the campaigns since 1980, only short annual reports and several brief articles are available (see the contributions of Bilgi in Kazı Sonuçları Toplantısı and Bilgi 1999a, 1999b, 2001, 2004).

10 Excavations also took place on İkiztepe I (Trench A, A', H), but the trenches provided almost exclusively late material of the Early Hittite period. Earlier prehistoric remains were recovered in Trench C on Mound I and Trench J on Mound III.

11 See reports in *Türk Arkeoloji Dergisi* 1974, 1975, and *Belleten* 1972, 1973, 1974, 1976, 1978.

12 Illustrations of sherds with comparisons at İkiztepe from Şirlek (Çirlek, Küşcular) Tepe, a small mound situated 4 km west of Bafra, were published by Burney (1956, Fig. 1.2, 4–6). Dönmez (2006) published illustrations of pottery from Kelebeş Tepe, Bakırdere Tepesi, and Tedigün Tepe in the alluvial plain of Kızılırmak and Ay Tepe near Kavak (Dönmez 2006).

13 E.g. the stone bracelets of serpentine found in the upper part of the Neolithic layer of the cave (Solovev 1958, 141, Pl. 2, 5).

14 Pichori 8, TB 460, 4245±60 BP, Ispani, TB 82, 4405±50 BP (Pkhakadze 1993, 26).

15 His model was based on three assumptions: 1) all prehistoric periods are represented in Alişar (i.e. the lowest level in Alişar is the earliest in central Anatolia); 2) there were no interruptions in the sequence of Alişar and 3) the earliest settlements in central Anatolia emerged as a result of diffusion from the Near East, and this diffusion may have began only around 3000 BC, with the rise of urban societies in Mesopotamia (thus the sequence at Alişar and in central Anatolia as a whole must postdate the baseline of 3000 BC).

16 Dönmez explains in a recent article (Dönmez 2006, 94) this obvious contradiction with Orthmann's scheme as follows: "The Central Black Sea region in general, and İkiztepe Late Chalcolithic culture specifically, fits well into W. Orthmann's formula [Late Chalcolithic = Early Bronze Age I]. There does not seem to be a serious problem with the chronology at İkiztepe based on this. According to this, the Late Chalcolithic and Early Bronze Age I Early Phase represents the same cultural process".

17 In an article that appeared in the same year, Parzinger (1993, 218 f.) discussed the stratigraphic sequence and material from Trench B on İkiztepe II and the connections of the pottery found in this trench to other sites in central Anatolia. While the exact correlations remain debatable, Parzinger's observation that a large part of the stratification of İkiztepe predates the Bronze Age (the third millennium BC) period is noteworthy.

18 Series of vessels with clear parallels in assemblage DD/EE have been published from several further trenches excavated after 1975: Trench J (Alkım et al. 2003), Trench L (Bilgi 1999b, Pl. 1; 1999a, Pl. 2–4; 1999c, Pl. 3–4), Trench D (Bilgi 1992, Fig. 17; 1993, Fig. 11), and Trench M (Bilgi 2002, Fig. 12).

19 From the burnt Layer 2, Beta-134069 and 146714, and from the superimposing Layer 1, Beta-134066. See for comments Schoop (2005, 92).

20 Çirlek Tepe (Kökten et al. 1945), Kelebeş Tepe and Tedigün Tepe (Dönmez 2002, 251–253), Sivri Tepe and Gökçeboğaz (Dönmez 2002, 248–250).

21 Geomorphological studies showed that the mounds were situated on the former bank of Kızılırmak; today the site lies at a distance of c. 1.5 km from the river (Alkım et al. 1988, 148 n. 2). Mound IV did not contain prehistoric layers.

22 Architectural remains associated with pottery of assemblage DD/EE have been investigated in Trench L on Mound III (see Bilgi 1999a, 1999b, 1999c) and in the trenches on Mound I (see e.g. Bilgi 2002), while Trench F did not contain preserved architecture.

23 Moreover, Dönmez and Naza Dönmez (2005) quote a description of the ancient architecture of the Pontus area made by Vitruvius, according to whom houses were erected on a rectangular timber frame constructed of tree logs, and their walls were plastered with mud.

24 Graves from the excavation campaigns in 1976–1980 were published in Alkım et al. (2003). For graves excavated between 1980 and 1990, only a list (including position, height, and grave finds) is available; the metal objects were published by Bilgi (1984, 1990). For graves recovered in 2000–2002, there is only a very short preliminary report (Bilgi 2004b).

25 There are also pithos graves of the MBA on Mound I just under the surface which are excluded from the discussion here (see Bilgi 2004b). See also Bilgi (2004b, 33 f.), who apparently dates the graves above NN 22 m to EBIII and those below 22 (22,70 m) to EBII. For graves on Mound III see Bilgi (1999d).

26 For the number of spearheads see Özbal et al. (2008, 69). Spearheads with bent tangs similar to the finds from İkiztepe originate from third-millennium contexts (Stronach 1957; Ivanova 2008a, 77 f., with further references); to my knowledge there are no examples earlier than the mid-third millennium BC. For the so-called poker-butt spearheads with straight shafts, the only type of spearheads dating to the fourth millennium BC, see Chapter 4 (however, such finds are absent in İkiztepe). Another indication for a third-millennium date of at least a part of the cemetery at İkiztepe I provides find İ/84–436, which contained beads of rock crystal, lead, and carnelian (Bilgi 1985, 111 f., Fig. 12). Comparisons offer EBA graves in north-central Anatolia, e.g. the beads and pendants of a wide variety of materials (frit, faience, marine shells, stone, limestone, malachite, carnelian, arsenical mineral [Uzonite], copper/bronze, silver, gold and occasionally electrum in graves at Resuloğlu and Kalınkaya (see Zimmermann and Yıldırım 2006, Fig. 5 and Yıldırım 2006).

27 E.g. in graves Sk 81, 101, 106, and 210, the quadruped spirals were associated with spearheads (see Bilgi 1984, Fig. 18, 272, 273, 276 and 277; Fig. 7, 4; Fig. 9, 18; Fig. 10, 19; Fig. 11, 28), see also Bilgi (1990, App II). In Sk 428, a lead "ring idol" was associated with a spearhead (Bilgi 1990, Fig. 7, 42; Fig. 19, 427).

28 Graves with pottery include Sk 276, Sk 347, Sk 425, Sk 544, Sk 562, Sk 574, Sk 165, Sk 119, Sk 247, Sk 270, Sk 71, Sk 74; for a description of the grave assemblages see Bilgi (1984, 1990).

29 E.g. in Trench D, Area C-19/ IV-11, Grave Sk 74 at a depth of 26,20 m and Grave Sk 247 at a depth of 23,40 m allegedly contained the same type of vessel (in Bilgi 1984). It is not possible to explain this difference in depth without detailed stratigraphic data. We can speculate that a phase of habitation accumulated between the higher and lower graves (i.e. the area was used repeatedly for habitation and burial). There was certainly an important settlement of the third millennium on Mound I as demonstrated by some pottery in Trenches A and C (Alkım et al. 1988, Pl. XI, 13, 15–17; Pl. XII; Pl. XVIII, 8–11 – for comparisons see Orthmann 1963, Pl. 10, 2/60, 45; Pl. 71); some small finds, e.g. the numerous decorated spindle whorls from Trench A (Alkım et al. 1988, Pl. XL, 1–11), also point in this direction.

30 It is important to stress the absence of published illustrations that demonstrate the association of the skeletons, vessels and metal weapons beyond doubt. Grave 581, for instance, contained among other finds a vessel of assemblage DD/EE (Bilgi 1990, Fig. 20, 451) and a dagger (Bilgi 1990, Fig. 14, 184) with a decoration that is very similar to the dagger in Grave 569 (Bilgi 1990, Fig. 14, 183). The latter was associated with a spearhead (Bilgi 1990, Fig. 10, 74). Thus, the vessel dates Grave 581 to the fourth millennium BC, while the dagger suggests a later third-millennium date. Only the publication of detailed graphical records can resolve contradictions such as this.

31 For "rich" graves see Bilgi (2005). At Tekeköy, graves with skeletons in extended and flexed positions were recovered but their dating is uncertain (see Kökten et al. 1945, Pl. LXXII).

32 Kalınkaya, an extramural cemetery situated north of Alacahöyük, encompassed Early Bronze Age graves with flexed skeletons placed in pithoi and cists, and several skeletons in extended supine positions, which Zimmermann (2007, 28 f.) tends to date to the "Chalcolithic". The site is unpublished; the unusual graves were described, according to Zimmermann, in the site documentation kept in the Museum of Anatolian Civilizations.

33 For stone cists on the Upper Euphrates see Palumbi (2008); for north-central Anatolia see the site of Resuloğlu (materials in the exposition of the Archaeological Museum in Çorum; Yıldırım 2006) and pithos graves at Kalınkaya (Zimmermann and Yıldırım 2006, Fig. 3; Zimmermann 2007); for west Anatolia see Stech Wheeler (1974), Seeher (2000) and Roodenberg and Alpaslan-Roodenberg (2008).

34 Today cash crops like hazelnuts and, east of Rize, tea predominate. In antiquity, olive was the major crop cultivated in the region of Sinop.

35 The earliest Greek colonies on the southern coast were Sinope, Amisos (Samsun) and Trapezunt. Halfway on the generally inhospitable coast, Sinope was one of the major Black Sea harbours of the Classical period.

36 Saddle querns were found at Alişar 13M (von der Osten 1937, Fig. 44).

37 While both fresh milk and fat (butter) deteriorate fast, rendered butter can be stored for longer periods. When fresh butter is heated its components separate; the purified butter oil can be skimmed off and the solids filtered. Butter oil as a storable product is a major fat supplier in regions with hot climate, where high-quality animal fats (e.g. pig fat) are not available for cultural or environmental reasons – e.g. in southwest Asia (samna) and south Asia (ghee).

38 In central Anatolia, similar loom weights were found at basal Alişar (von der Osten 1937, Fig. 99).

39 Copper smelting began in Anatolia around 5000 BC (see Chapter 4). For an earlier "slag" from Çatalhöyük (most probably a piece of malachite heated during the conflagration of the settlement) see Schoop (1995, 37 f.). Recent re-investigations of the metal artefacts from Mersin XVI in Cilicia, dating to c. 5000 BC, by Yalçın (2000a) suggested that both the chemical composition and the metallographic features of these objects comply with metal smelted from copper ores.

40 For the deposits of copper ores, silver-containing lead ores, and arsenic-bearing minerals used by the inhabitants of İkiztepe see Özbal et al. (2002, 43, Fig. 4; Özbal et al. 2008, 70 f.). Koçak (2006) provides information for ancient slag heaps containing stone tools in the Bakırçay valley in Tavşan dağ north of Merzifon and Inegöl dağ near Gümüşhacıköy.

41 Three samples of crucible slags from İkiztepe have been studied by Özbal et al. (2002, 45, Table 3; 2008, 74 f.). Provenance of the samples: Trench C (slag on a crucible fragment and a larger slagged crucible fragment), Trench D second level (slag with prills containing 3.99% arsenic) (Özbal et al. 2008, 72–75).

42 The site of Büyük Güllücek in north-central Anatolia yielded two flat axes with arsenic contents below 1% (Yakar 1985, 65). Furthermore, a metal hoard found in Level XXXIV at Beycesultan in western Anatolia consisted of a silver ring and several copper objects, the majority of which were unalloyed, but some contained small quantities of arsenic (Yakar 1985, 64).

43 A casting mould for similar artefacts has been reported from Çamlıbel Tarlası, a site in north-central Anatolia dating to the middle of the fourth millennium BC (Schoop 2009, Fig. 62). A silver ring-pendant from Alepotrypa in south Greece may also date to the fourth millennium BC (see Maran 2000, 188).

44 E.g. the silver and copper pendants from the EBI cemetery at Baklatepe (Erkanal and Özkan 1999, 124–6, Figs. 29–30) and a similar object from the Copper Age (Troy I) layer at Alişar (von der Osten 1937, Fig. 197, c753). Two ring-pendants from north-central Anatolia, a gold pendant from the third-millennium BC cemetery at Kalınkaya and a chance find of a silver pendant allegedly from Göller (Zimmermann 2005, 194) attest to the presence of this specific artefact in the Anatolian interior but do not contribute to its chronology. Several further small objects of lead, gold and silver have been reported from İkiztepe, but most specimens originate from contexts that are difficult to date. For example, a lead appliqué (İ/84–150) was found in Grave sk 581 and lead rings in Grave Sk 574 (Bilgi 1990, Fig. 19, 430; Fig. 18, 376). The rings were associated with spearheads of arsenical copper and date probably to the third millennium BC. Gold rings were found in Grave sk 581 (Bilgi 1990, Fig. 17, 331). A silver clip (İ/92–64) from Trench D (Bilgi 1992, 237, Fig. 14) most likely also postdates the fourth millennium BC.

45 Shaft-hole tools are absent at İkiztepe. Among the earliest shaft-hole axes in Anatolia and the east Aegean are the finds from Poliochni on Lemnos (a casting mould from phase azzurro evoluto and an axe from phase rosso; Bernabò-Brea 1964, Pl. LXXXV and Pl. CLXXIII), and from Resuloğu, Horoztepe and Kalınkaya in north-central Anatolia (Yıldırım 2006, 8, Fig. 14), all dating to the third millennium BC.

46 One of the axes was found in Trench J (I/77–128), the other in Trench L (Alkım et al. 2003, Pl. CXXVI, 169; Bilgi 1994, 143, Fig. 12). However, the pottery material associated with the finds is not fully published and the area also provided Bronze Age finds (e.g. a Bronze Age–type spearhead, found during cleaning; Bilgi 1994, 144, Fig. 20). Comparable axes have been reported from third-millennium BC contexts, e.g. the axes from Troy (Korfmann 2000, Fig. 12, 2; Sazci 2007), Arslantepe VIB, Beycesultan X, Thermi, Tarsus, and Soloi (Frangipane et al. 2001, Fig. 21, 3; Lloyd and Mellaart 1962, 286, with references, Fig. 9, 7).

47 Sk 581, Sk 562, Sk 425, Sk 574, and Sk 347 contained tanged daggers in association with spearheads (Bilgi 1984, 1990). Some daggers seem to have formal

comparisons among finds of the late Kura-Arax period (cf. Kushnareva 1993, Fig. 29, 32.33).

48 A fragment of a possible tanged dagger was found at Alişar Level 12. This object, however, originated "from the refuse layers of the highest building level" (von der Osten 1937, 91, Fig. 96 c419) and may be intrusive.

49 See Schoop (2005, Pl. 57; Pl. 150, 1, 4, 8, 10; Pl. 154, 3–4), Esin (1993, Fig. 9), Steadman (1995), Todorova and Vajsov (1993, Fig. 107, 6; Fig. 111; Fig. 126, 8, 12) and Nikolov (1998, 177 f.).

8. CONCLUSIONS: THE BLACK SEA AND THE OUTSIDE WORLD

1 "Hulled" means that during threshing the rachis segments break into spikelets and the grain remains enclosed in the chaff; in contrast, the rachis of the "naked" varieties remains complete, while the chaff breaks and releases the grain.

2 For finds of broomcorn millet from the early-fifth-millennium layer of Tell Durankulak see Marinova (2006, Table 7.1b). Millet has been identified by all archaeobotanical studies at fourth-millennium sites in the northwest and north coastlands of the Black Sea (e.g. at Usatovo, Majaki, Purkary, Mikhajlovka; see Chapters 5 and 6) and possibly in the north Caucasus (see Chapter 4). Broomcorn millet may have predominated over emmer as the most important crop in these regions.

3 More evidence for millet cultivation in China is available for the sixth and fifth millennia BC (Hunt et al. 2008). Striking is the presence of broomcorn millet at late-sixth- and fifth-millennium sites in many regions of the Old World, for example in east Iran (at Tepe Yahya VI; see Nesbitt and Summers 1988, 95), Dagestan, Azerbaijan, east Georgia (Lisitsyna 1984, Table 2) and central Europe (Motuzaite-Matuzeviciute et al. 2009 with references). In contrast, broomcorn millet was apparently not cultivated in the Fertile Crescent and Anatolia before the first millennium BC (Nesbitt and Summers 1988). Foxtail millet (*Setaria italica*) is present at PPNA and later neolithic sites in Syria (Hunt et al. 2008, Table 1).

4 Evidence for plant cultivation in the eastern and central Eurasian steppe is virtually absent, but this situation is probably the result of excavation techniques and research strategy. The earliest domestic animals (including sheep) in the south Ural appeared in the late seventh and the sixth millennia BC and were apparently introduced from Iran (see Matyushin 2003, 374–378, Fig. 24.7).

5 Cooking, soaking and the microflora in the human digestive system reduce it only insufficiently.

6 At room temperature milk spoils within one hour. Fresh milk contains milk sugar (lactose), a complex carbohydrate that has to be broken down in the intestine by the enzyme lactase. Production of lactase in mammals is genetically regulated and ceases after the infant stage. The ability of adult individuals to consume larger amounts of fresh milk is dependent on "lactase-persistence", the persistence of the production of the enzyme lactase after infancy. Recent molecular genetic research has demonstrated that lactase persistence is genetically controlled (Swallow 2003; Poulter et al. 2003; Enattah et al. 2002).

7 For the role of beer in traditional societies in Africa see Netting (1964) and Arthur (2003).

8 These results are in agreement with research on the genetic background of the Eurasian grapevines (*Vitis vinifera* L.), which suggests two regions of domestication, in southwest Asia and in the western Mediterranean (Arroyo-García et al. 2006).

9 Barber (1991, 211) even suggests that the ability of animal fibres to absorb dyes in appealing colours was a major reason for the widespread replacement of bast fibres by wool, since colourful and decorative textiles are very attractive.

10 About the ^{14}C dates for Ust Karenga see Kuzmin (2002) and Kuzmin and Vetrov (2007). For ^{14}C-dated early pottery in other regions of East Asia see Kuzmin (2006, 2010).

11 The earliest evidence of sub-surface extraction of copper ores in Eastern Europe originates from the east and central Balkans and dates to the early to mid-fifth millennium BC (Ottaway 1994, 53–57, with references; Borić 2009, 237). The scarcity of smelting slags and production debris during the fifth millennium BC speaks for "slagless" smelting of high-grade copper ores and the production of small quantities of metal, possibly in a crucible (in laboratory conditions; Zwicker et al. 1985, 104, Fig. 3, were able to successfully smelt malachite in a crucible with three blowpipes and no slag formed). The earliest evidence for smelting in the central Balkans originates from Belovode, a site of the Tordoš and Gradac phases of the Vinca culture (Borić 2009, 207–209, 238). ^{14}C samples date the habitation period at this site between c. 5350 and 4650 cal. BC. Large quantities of malachite were recovered from all deposits at Belovode, often together with charcoal. Slags came to light in Trench 3 in association with Vinča- Tordoš material (there are no ^{14}C dates from this deposit), while a casting mould was found together with material of the latest (Gradac) settlement phase. In summary, the evidence from Belovode suggests an intensive use of malachite, with thermal treating/smelting starting around the end of the sixth millennium BC. The earliest large cast objects in southeast Europe date to the second quarter of the fifth millennium BC (e.g. the flat axes from Slatino and Durankulak; see Todorova 1999, 237, Fig. 4). Cast solid artefacts became frequent around 4500 BC, and the first gold artefacts and shafthole tools also appeared at this time (see Chapter 6 and Ryndina 2003).

12 For melting pure copper 1083°C, for gold 1064°C, for silver 962°C. See Craddock (1995, 16): "Most ceramic bodies used in antiquity begin to soften and melt as the temperature rises above about 900°C, becoming completely molten by about 1250°C".

13 At Mersin XVI around 5000–4700 BC (Yalçın 2000a; for the dating of Mersin XVI see also Schoop 2005, 138 f., with references). Casting in southwest Asia and in southeast Europe began with nearly identical tool shapes (flat axes); shaft-hole tools did not appear before 4500 BC.

14 Grave 626 at Durankulak contained small beads of copper and malachite dating around 5000 BC (Todorova 1999, 237). Moreover, small copper items were found in the context of assemblage AA at İkiztepe dating around the turn of the sixth to the fifth millennium BC (see Chapter 7).

15 Several small copper objects have been reported from fifth-millennium sites in the north Caucasus: a bead from Svobodnoe (Nekhaev 1992, 79), an awl from Jasenovaja poljana (Formozov and Chernykh 1964, 109), and two round convex copper appliqués from Verkhnyj Akbash (Korenevskij and Nagler 1987, Fig. 2, 1–2). Moreover, a chance find of an axe-adze from Ust Labinsk (Iljukov 1981) and a short copper dagger from Khadzhokh III (Formozov 1961, Fig. 23, 3) apparently date to the early fourth millennium BC. The axe-adze contained 1.5% arsenic; its shape closely reminds one of Ariuşd-type axe-adzes which date to the transition from the fifth to the fourth millennium BC. For other chance finds of this type see Ryndina (2003).

16 Either the ox will exist on its reserves and quickly lose weight, or it has to obtain expensive concentrated feed. Starkey (1989, 29) emphasizes that the costs for supplementary feed for one animal might exceed those for maintaining a pair on grazing alone.

17 The earliest evidence for the emergence of a pole-and-yoke draught system, a wall painting of two oxen and a coachman driving one of them on reins from Temple B, Corridor A 796, at Arslantepe VIA (Frangipane 1997, 64, Abb. 15), dates to the second half of the fourth millennium BC. For Late Uruk pictogramms

of ards with draught pole (beam) and two handles see Sherratt (1981, 266 f., Fig. 10.4).

18 The earliest secure evidence for the use of metallic copper dates to the PPNB period (see Chapter 3). For metallic copper in the earliest farming villages in the Balkans see Chapter 6.

19 For Iran, southwest Asia and Anatolia see Chapter 4, for southeast Europe see Chapter 6.

20 For the Middle East see Chapter 4, for southeast Europe see Chapter 6.

21 The "autonomy" of metallurgy and metalwork in southeast Europe postulated by Renfrew (1969) thus seems highly unlikely.

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